18th Annual Meeting, American College of Chest Physicians
Congress Hotel, Chicago, Illinois, June 5 - 8, 1952

VOLUME XXI NUMBER 5

DISEASES

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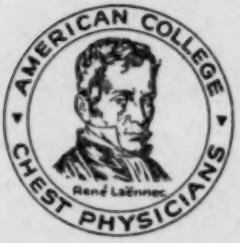

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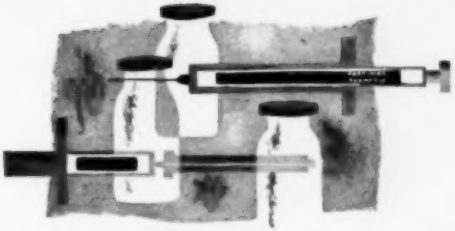

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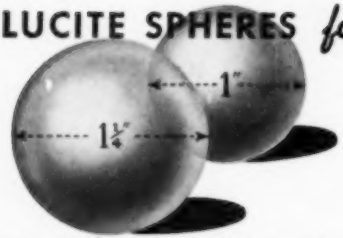

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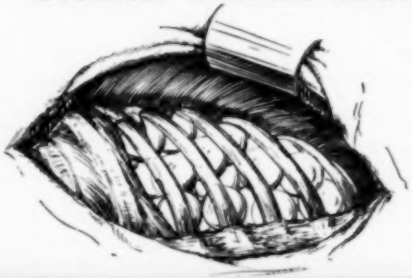

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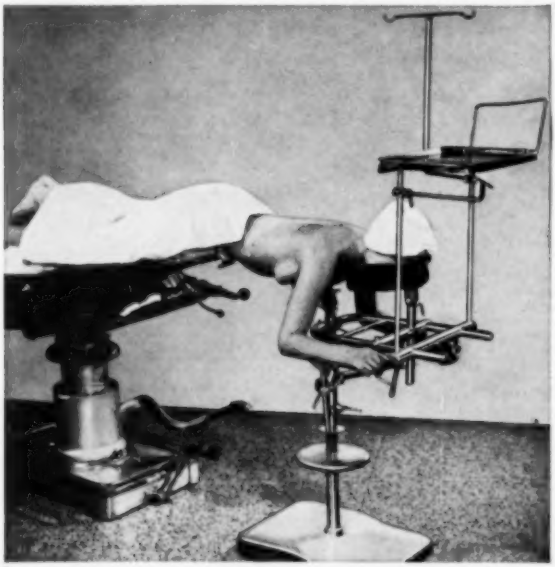

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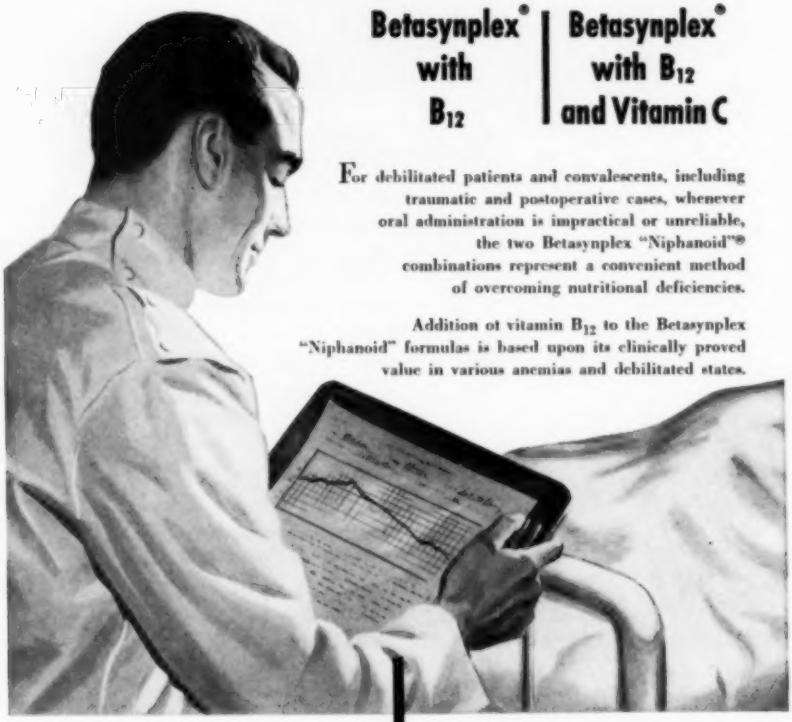

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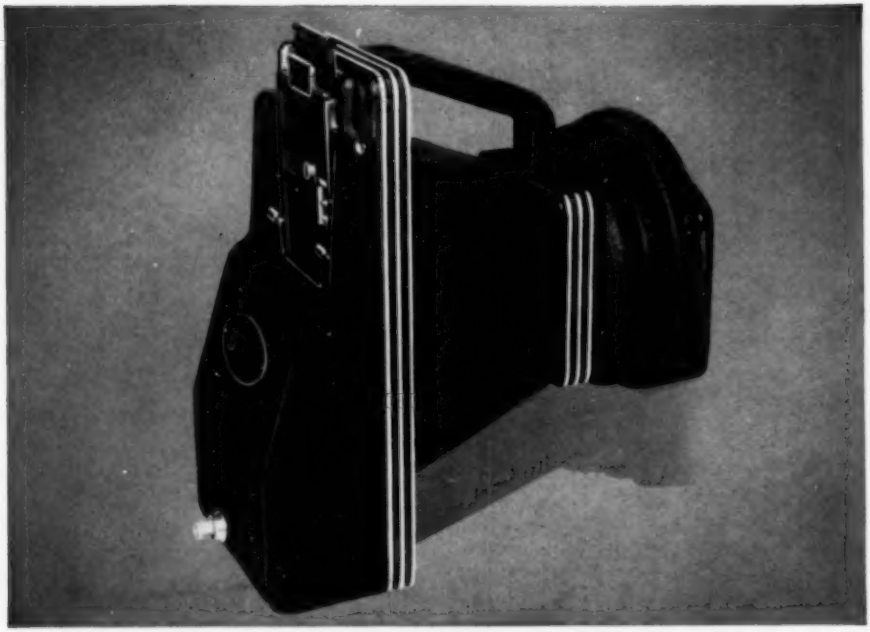

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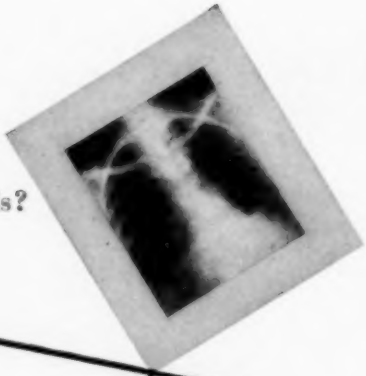

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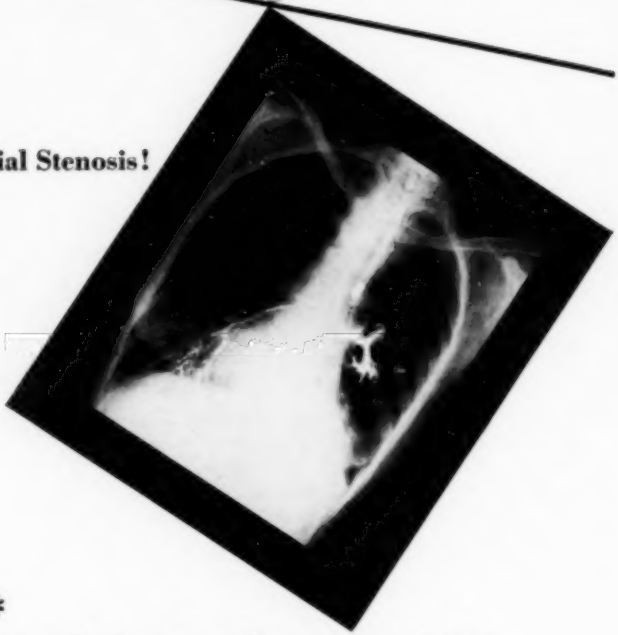

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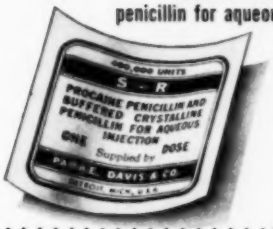
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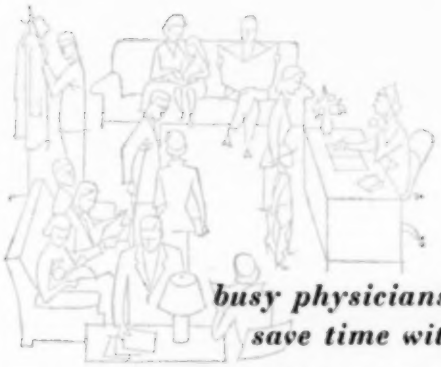

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Newer Palliative Measures in the Management of Inoperable Bronchogenic Carcinoma

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Introduction

Despite steady progress toward earlier diagnosis and improved surgical treatment, the high mortality of bronchogenic carcinoma has not been significantly reduced. The over-all survival rate is still not much better than 5 per cent. Ninety per cent of our patients were inoperable and 65 per cent of these already had metastases on admission. Roughly estimated, there were about 30,000 inoperable cases in this country in 1950 as compared with about 14,000 a decade ago. The significant and steadily increasing number of such patients makes it mandatory that palliative measures be employed whenever feasible, to contribute toward the maintenance of their comfort and their useful activity during the downhill progress of the disease.

Newer methods of treatment now available for the inoperable patient can provide excellent means of palliation and occasionally even prolong life. The distressing major symptoms resulting from extension of the malignant process may be temporarily alleviated, sometimes to a marked degree.

A number of new and promising palliative measures applicable to bronchogenic carcinoma have been recently reported from widely varied fields of therapy. We have therefore felt it worth-

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TABLE I: PALLIATIVE MEASURES IN INOPERABLE BRONCHOGENIC CARCINOMA

Pathologic Physiology	*Clinical Symptoms*	*Radiological*	*Surgical*	*Medical*
bronchial proliferation and obstruction	cough dyspnea wheezing hemoptysis	palliative x-ray therapy (3000r) intensive x-ray therapy (5000-6000r in 30-60 days) 200-400 kv. "cross-fire" or "rotation" techniques Telecurie therapy—Co^{60} multi-million volt x-rays radioactive colloidal gold (Au 198)	bronchoscopic fulguration palliative resection lobectomy pneumonectomy	i.v. nitrogen mistard (HN_2) 0.1 mg./kilo x 4 oral nitrogen mustard (TEM) bronchodilator drugs steam inhalations
pulmonary infection	fever chills cough expectoration malaise toxemia	radiation therapy to blocked bronchus to compressing nodes for aeration and drainage	bronchoscopic fulguration for drainage thoracotomy for empyema palliative resection for abscess or necrosis	nitrogen mustards to relieve obstruction to allay toxemia postural drainage bronchoscopic drainage bronchodilator drugs antibiotics
local invasion	pain	radiation therapy	neuro-surgery neurectomy rhizotomy cordotomy pre-frontal lobotomy topectomy	ethyl chloride spray local procaine injection i.v. alcohol, 5-10 per cent newer narcotics: dromoran demerol metapon methadon
pathological fracture	pain disability	roentgen therapy	orthopedic measures	i.v. nitrogen mustard procaine injection

advancing neoplastic disease	malnutrition weakness anxiety insomnia anorexia	radiation therapy 3000r to multiple areas		nitrogen mustards high caloric diet lipo-mul-oral i.v. glucose amigen alcohol vitamin supplements testosterone cortisone transfusions
hypoadrenalism due to metastasis	aesthenia			adrenal hormone sodium chloride DOCA
brain invasion	hemiplegia, etc.	conventional roentgen therapy Marks grid high energy x-ray therapy		
hemoptysis	anemia weakness	roentgen therapy	emergency resection, if fulminating	i.v. nitrogen mustard medical measures
pleural effusion	dyspnea disability	roentgen therapy intrapleural radioactive colloidal gold (Au 198)	pleural resection	thoracentesis intrapleural HN_2
superior vena cava compression syndrome	severe cyanosis dyspnea orthopnea, swelling of head and neck complete disability	radiation therapy		i.v. nitrogen mustard oxygen
radiation sickness	loss of appetite, nausea, vomiting, weakness			DOCA pyridoxine replace electrolytes and water
nitrogen mustard sickness	nausea vomiting			sedation cortisone

while to assemble and present them here, citing our own experience as well, in the use of (1) radiation therapy, (2) nitrogen mustard, (3) surgical techniques, and (4) medical procedures (Table I). We have employed these to fair advantage in a combined experience of nearly 700 cases in both office and hospital practice.*

1) *Radiation Therapy:*

In the past 15 years, a series of more than 600 patients with inoperable bronchogenic carcinoma have received roentgen therapy in the Radiation Clinic at the Veterans Administration Hospital (Bronx, New York). This has proved the most effective for symptomatic relief. In selected cases, effective palliation of intractable symptoms and prolongation of useful life may be achieved. In such instances, relief from the distressing symptoms of pain, cough, expectoration, dyspnea, orthopnea and hemoptysis is associated with objective evidence of improvement such as disappearance of obstructive pneumonitis, regression of parenchymal infiltrations, shrinking of hilar, mediastinal and peripheral lymph nodes, healing of pathological fractures, and relief from the superior vena cava compression syndrome.

Optimum results were attained in fairly well-nourished individuals with radiosensitive lesions of relatively limited extent, employing a precision "cross-fire" technique. Such patients received and tolerated well a carefully planned, intensive course of deep x-ray therapy at cancerocidal dose levels (5000r to 6000r to the tumor in 30 to 60 days), with x-rays generated at energies of 200 to 400 kilovolts. On rare occasions, the primary lesion can be obliterated. Cachetic, aged patients with far advanced disease and those with necrotizing and cavitating lesions responded poorly to radiation and should generally not be treated with this agent. An intermediate group of patients received palliative radiotherapy at lower levels (below 3000r) and a majority of these experienced symptomatic relief.

In our series, 73 per cent of the lesions were epidermoid, 10 per cent adenocarcinoma, and 17 per cent of the undifferentiated variety.[33] The histological pattern often provides a clue to the radiological response that one may expect. Epidermoid carcinomas, as a rule, respond better to radiation than the adenocarcinoma or "mucous gland" type. Undifferentiated cell types may be as radiosensitive as lymphomas. Particularly is this true of the "oat-cell" variety in which striking palliation may be accomplished with moderate doses far short of cancerocidal levels. The Pancoast type tumor is generally quite radioresistant. Metastatic foci usually respond as well as the primary lesion except for pleural invasion

with or without effusion. Consideration for roentgen ray therapy should be weighed for every patient with inoperable bronchogenic carcinoma as soon as the diagnosis and the determination of inoperability are established.

Case Reports

Case 1: A 41 year old stevedore received 4000r (tumor dose) in 47 days to an advanced primary "oat-cell" bronchial carcinoma, and to a metastatic focus in the right posterior eighth rib (Figure 1a). Prompt radiographic clearing of the lesions was noted (Figure 1b), associated with regression of chills, fever, intractable cough, heavy expectoration, hemoptysis, pain and dyspnea. He was discharged from the hospital for a 90 day furlough, and gained weight (16 pounds), strength and appetite. Six months after initiation of radiation therapy, he died of generalized metastases involving principally the liver.

Case 2: A 40 year old veteran received deep roentgenray therapy (approximately 3000r to the tumor) for relief from severe superior vena cava compression syndrome secondary to anaplastic bronchogenic carcinoma. Striking improvement was achieved and the patient remained well at home for more than nine months when his complaints recurred. Supplementary roentgen ray therapy appeared unfeasible because there were persistent radiation changes of the skin. Nitrogen mustard, administered intravenously, achieved complete relief of pain and dyspnea, and regression of venous engorgement of the neck, lasting nearly a month. At this time an interesting lead grid devised by Marks[1] was employed to minimize the radiation skin reaction and deep x-ray therapy was again administered, with added palliative benefit to the patient.

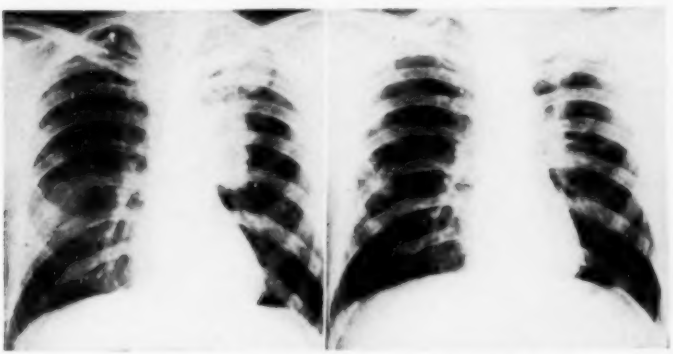

FIGURE 1a FIGURE 1b

Case 1, Figure 1a: Inoperable "oat-cell" bronchial carcinoma with massive left hilar lymphadenopathy and parenchymal tumor, left upper lobe. Note pathological fracture, right posterior 8th rib. — *Figure 1b:* After deep roentgen therapy (4000r tumor dose in 47 days), note striking radiographic evidence of improvement, associated with relief from fever, cough, expectoration, hemoptysis, dyspnea and pain. Gained 16 pounds in weight during a remission which lasted about 12 weeks.

Case 3: A 48 year old male clerk, with inoperable bronchogenic carcinoma, occluding the right main bronchus (Figure 3a) received approximately 3000r (tumor dose) to the lesion with unusual regression of tumor and atelectasis (Figure 3b), accompanied by distinct clinical improvement. The patient expired 15 months later of an intracranial metastasis.

Case 4: A 49 year old chauffeur, with an advanced bronchogenic carcinoma of the left upper lobe bronchus (Figure 4a) proved inoperable by exploratory thoracotomy, received approximately 3500r (tumor dose). There was regression of pain, improvement of general well-being, gain in weight and strength, and cessation of hemoptysis. This was associated with almost complete regression of the left upper lobe neoplasm (Figure

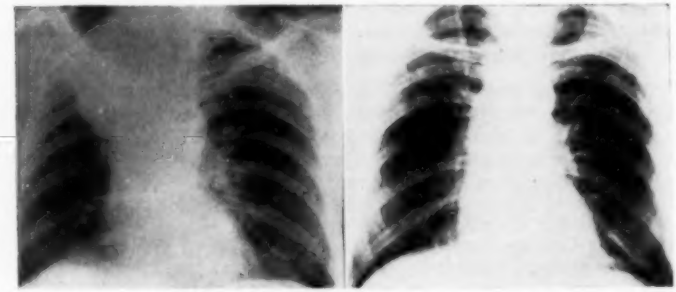

FIGURE 2a FIGURE 2b

Case 3, Figure 2a: Inoperable bronchogenic carcinoma occluding right main bronchus with extension into the parenchyma of the right upper lobe.—*Figure 2b:* After deep roentgen therapy (3000r tumor dose), note almost complete regression of the tumor and atelectasis. This was accompanied by distinct clinical improvement of several months duration.

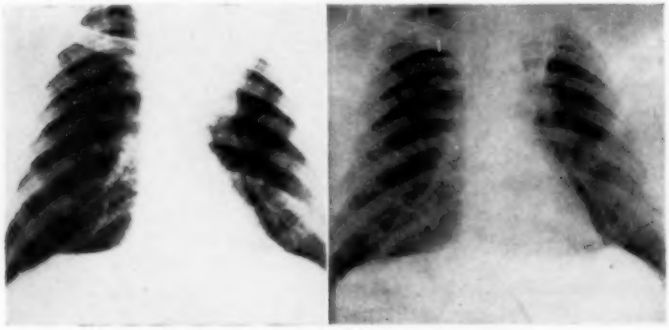

FIGURE 3a FIGURE 3b

Case 4, Figure 3a: Advanced carcinoma of left upper lobe bronchus with atelectasis associated with severe pain and hemoptysis.—*Figure 3b:* Note almost complete regression of left upper lobe neoplasm after 3500r tumor dose. Patient enjoyed a comfortable remission of about eight months.

4b). The patient was still alive and in good condition eight months after completion of radiotherapy.

Our experience with radiation therapy as the most effective palliative measure in bronchogenic carcinoma is supported by the observations of Craver,[2] Leddy and Moersch,[3] Tenzel,[4] and Widman.[5] These investigators reported similar results in a combined total of 508 roentgenray-treated patients. Although radiotherapy has not proved effective as a curative agent for primary bronchial cancer, Leddy and Moersch[3] have reported that 25 of their 125 patients were alive from one to 12 years, while Craver[2] observed a five-year survival of 3.8 per cent in his series of irradiated bronchogenic neoplasms. Of unusual interest is the report of Wood[6] that of 11 cases assessed as bronchoscopically inoperable before treatment, five became operable after radiation and had pneumoncetomies performed. Wood[6] also noted that, of 20 patients with superior mediastinal obstruction, there was complete disappearance of the signs in 12 and diminution in four others.

Brooks and his colleagues[39] concluded, at the end of the first five years' work, that "x-ray therapy holds out the only regular means of symptomatic relief and prolongation of life in the majority of patients with inoperable cancer of the bronchus who came to the hospital." They reported[39] that the primary tumor can sometimes be made to disappear, as indicated in four necropsies and one operation in their study of 129 patients who received

FIGURE 4a FIGURE 4b

Figure 4a: Note massive lesion occupying right upper lobe with hilar lymphadenopathy and atelectasis.—*Figure 4b:* After 23 million volt x-ray therapy delivered by the Betatron. Note almost complete disappearance of lesion, associated with striking symptomatic benefit of several months duration. This patient still alive and symptom-free.—Published through the courtesy of Drs. Burchell and Watson, Saskatoon Cancer Clinic, Saskatoon, Sask., Canada.

radical x-ray therapy. Thus there appears to be cumulative and convincing evidence that radiation therapy can provide symptomatic palliation, prolongation of life, and even a rare chance for cure.

In the past five years, there have been significant advances in the more effective roentgen ray therapy of deep-seated neoplasms, particularly of those of bronchial origin. These advances have been associated with remarkable contemporary developments in radiophysics, radiobiology, megavoltage engineering, and nuclear fission. Their ultimate objective is the delivery of cancerocidal irradiation to the deep-seated neoplasm, with minimal radiation trauma to the skin, lung and other intervening normal structures. Briefly presented, they include:

1) more accurate localization of the tumor through new roentgenographic techniques,

2) more precisional "cross-fire" irradiation of the malignant lesion through multiple portals, with the aid of new engineering devices such as those designed by Dobbie,[7] Demy,[8] and one of the authors (B.R.[9]).

3) rotation[10,11] of the patient's deep-seated tumor in the path of a single penetrating x-ray beam like a "chicken on a spit," or rotation of the beam around the lesion in pendulum or spiral fashion. This latter technique appears particularly successful in eccentric tumors such as those in the lung periphery, those invading the pleura, and in the Pancoast variety.[11]

4) closer approach to an optimum dose formula—tumor dose/treatment days. Roentgen ray therapy, like chemotherapy, is ineffective in homeopathic doses delivered over extended periods of time, and harmful in hyperintensive therapeutic regimens.

5) reduction of local and systemic radiation reactions to the point where they no longer represent serious obstacles to successful completion of a prescribed course of rigorous radiotherapy. New chemotherapeutic agents,[12] improved techniques,[10,11] ingenious new devices,[1] high energy x-ray beams,[13,16] and optimum dosage formulae have greatly minimized these complications. Marks[17] has recently noted unusual results in far advanced cases with cerebral and skeletal metastases, utilizing an ingenious lead-rubber "grid" of his own design for protection of the skin, conventional 200 KV x-ray beams, and relatively high dose levels. For example, one patient, with hemiplegia, convulsions and speech difficulty, secondary to cerebral metastasis from advanced epidermoid carcinoma of the lung, was completely restored to normal functional activity at the end of the therapeutic course. In another instance, healing of pathological fractures of the thoracic cage and dorsal spine was accomplished. Through chemotherapy,[18]

there is now some hope of ameliorating radiation pulmonary fibrosis, a late complication which may harass those patients whose neoplastic disease is controlled for long periods by cancerocidal radiation.

6) In the past five years there has been a strong trend towards the use of multi-million volt roentgenray beams in the treatment of deep-seated neoplasms. Massive generators operating from 2 to 24 million volts are already in use in several clinics in this country, in Canada, and in Europe. This interesting trend appears justified on theoretical grounds and on the preliminary clinical trials as well, particularly in bronchogenic carcinoma. It now becomes possible to irradiate any deep tumor without delivering excessively high doses outside the tumor region. Thus, the normal lung tissue in close association to the cancerous area may be spared, as well as the skin and other normal tissues in the path of the x-ray beam. Skin damage and radiation sickness are rarely observed in high energy roentgen ray treatment.

For example, Hare[14] has treated, with the 2 million volt Betatron, 13 cases of bronchial carcinoma, most of whom already had lymph node metastases at the time treatment was instituted. Of these, three are alive and well without disease nine to 12 months after completion of treatment. In all cases, there was satisfactory resolution of the primary tumor following this type of therapy. Again, Burkell and Watson[15] have treated eight patients with advanced inoperable bronchogenic tumors employing a 23 million volt Betatron. Seven of these patients experienced marked subjective and objective signs of improvement, lasting up to seven months. Four patients are still alive, symptom-free, and have gained in weight from seven to 17 pounds. Roentgen ray evidence of improvement was noted in all four cases. A typical example of the radiological response is noted in Figures 4a and 4b. No unpleasant constitutional reactions to this high energy radiation were noted in any case, and only a mild erythema of the skin could be detected. These authors[15] state that "there is no doubt in our minds that the 23 MEV Betatron is of great value in palliation of cancer of the lung." From the University of Illinois, College of Medicine, Harvey[16] reports that the 23 million volt Betatron is already giving improved results in advanced inoperable bronchogenic carcinoma. Remissions lasting nearly a year have been achieved in the Pancoast type tumors which are resistant to conventional radiotherapy and responsible for much pain and distress.

The powerful and penetrating gamma rays of radium have long been useful in the treatment of deep-seated inaccessible cancers such as those in the lung. However, few clinics indeed could afford

the several grams of radium required for a radium pack or "bomb" employed in telecurie-therapy. Nor is the world's supply of radium adequate for more than a few such units. Today there are available from the nuclear reactors or piles, almost unlimited amounts of radium substitutes for cancer therapy. In particular, there is the radioactive isotope of cobalt (Co_{60}—half-life five years), which delivers radiation similar to those of radium or of a 2 million volt x-ray machine. Meneely, Kory, Auerbach and Hahn[40] recently instilled, via the bronchoscope, radioactive colloidal gold into one lung of dogs and found that intensive radiation could thus be delivered directly to a pulmonary segment and regional lymph nodes. Only a negligible quantity of radioactivity reached the liver and spleen. They concluded that "this intrabronchial route of administration might permit internal radiation of carcinoma of the lung which has spread to the regional nodes." Their clinical experience with this method in humans is still limited. It appears to us that intrapleural administration in patients with pleural invasion and effusion may be effective in controlling the rapid accumulation of fluid.

The mobilization for cancer therapy of massive particle accelerators used in atom-smashing studies has recently excited considerable interest. In England, a 10 million volt linear accelerator will be put into clinical practice for the first time within the next few months.[19] In the United States two 70 million volt synchrotrons are soon to be adapted for oncologic therapy. Finally, the prospect is encouraging for the greater therapeutic efficiency of a high energy *electron* beam from the Betatron in the treatment of deep-seated neoplasms in the thorax.

2) *Nitrogen Mustard Therapy:*

Not every person with inoperable bronchogenic carcinoma can be offered the benefits which modern roentgen therapy can sometimes offer. Radiation may become unfeasible or ineffective at variable intervals in the course of the disease because of radiation resistance, intractable constitutional symptoms, advanced generalization, or acute mediastinal compression. At such periods we have found nitrogen mustard—HN_2 (methyl-bis beta-chloroethyl amino hydrochloride)* a truly valuable systemic adjunct.[20,21] This experience is supported by several other investigating groups who analyzed a combined total of 161 patients treated with nitrogen mustard.[22-25] In 110 cases (68.3 per cent) a favorable symptomatic and/or objective response was observed.

In a recent study of 40 such patients, one of the authors (B.R.[21])

*Supplied for this investigative study through the courtesy of Merck & Company, Rahway, New Jersey.

reported that in 30 cases there was a favorable subjective response to intravenous nitrogen mustard, characterized by relief from fever, night sweats, weakness, anorexia, chest pain, cough and dyspnea, lasting from one to 17 weeks. In 19 of these 30 cases, there were noted objective signs of improvement, including relief from acute superior vena cava compression syndrome, gain in weight, resorption of pleural fluid, and improvement of pulmonary aeration, after regression of obstructive pneumonitis and associated parenchymal contraction. In 12 individuals, improvement in severe systemic symptoms through HN_2 made it possible to initiate definitive x-ray therapy. Five of these patients responded so well to radiation that they were then discharged to their homes for variable periods.

As in our experience with radiotherapy, individuals with the more undifferentiated lesions responded best to nitrogen mustard. Of 23 such cases, for example, 20 responded favorably while only one-half of the epidermoid and adenocarcinomas benefitted. It has been recently reported that the rare alveolar cell type does not respond well to HN_2.[26]

Of particular interest was the encouraging response to this agent of patients with acute severe compression of the superior mediastinal structures secondary to rapidly growing bronchial carcinoma. Sooner or later such patients will need emergency relief from strangulation symptoms and are then too gravely ill to be transferred to radiotherapy apparatus. In seven out of nine such cases, nitrogen mustard produced prompt remissions. The clinical benefits of HN_2 were often apparent before the course of four daily treatments was completed.

Case 5: A 55 year old veteran, was admitted with the full-blown clinical syndrome of superior vena cava compression. The intensity of dyspnea, orthopnea, cyanosis, and swelling of the head and neck was most alarming. He began to experience improvement during the course of HN_2 therapy and finally became relieved from strangulation signs and symptoms, gaining weight, strength and appetite. There were associated clinical signs of improvement (Figures 5a and 5b). He was discharged from the hospital and remained well at home for about seven weeks.

The Pancoast type of tumor and those lesions invading the pleura are notoriously resistant to conventional radiotherapy but occasionally may respond well to intravenous nitrogen mustard.

Case 6: A 48 year old auto mechanic was refractory to a tumor dose of 4500r administered for severe chest pain secondary to pleural invasion by bronchial carcinoma. A single course of HN_2 produced striking relief of pain and improvement in appetite and well-being. Patient was able to return home to normal activity for a period of eight weeks.

Objective evidence of improvement is sometimes lacking despite definite subjective improvement. Histological studies reveal min-

imal cellular changes after HN_2 therapy. These changes resemble the reactions to small doses of radiation. However, complete destruction of tumor tissue after therapeutic doses of HN_2 has never been demonstrated. This is in sharp contrast to radiotherapy, which can totally destroy the local neoplasm.[2,3,39]

Case 7: A 40 year old veteran presented marked dyspnea, pain, fever, chills and anorexia, associated with atelectasis of the right lower lobe, with metastatic deposits in both lung fields and in the mediastinal nodes. He was too ill for transportation to the Radiotherapy Department (Figure 6a). After a single course of nitrogen mustard therapy there was considerable clinical improvement characterized by gain in appetite, strength and relief from fever and dyspnea. There was roentgen ray evidence of regression of atelectasis of the right lower lobe but there was also enlargement of metastatic parenchymal deposits (Figure 6b).

Nitrogen mustard was administered intravenously in doses of 0.1 mg. per kilogram of body weight, once daily for four consecutive days. This "course" was repeated, if indicated, in not less than four week intervals. In desperate cases, 0.2 mg. per kilogram body weight was given on each of two consecutive days. The technique of administration has been previously described by one of the authors (B.R.[20,21]). Nausea and vomiting were encountered in the majority of the cases. It is important to recall that intravenous nitrogen mustard is a severe systemic toxin capable of irreparable

FIGURE 5a FIGURE 5b

Case 5, Figure 5a: Advanced bronchogenic carcinoma with superior vena cava compression syndrome. Note marked dilatation of superficial veins of the thorax.—*Figure 5b:* After one course of HN_2 therapy, note marked improvement in obstructive signs associated with relief from dyspnea, orthopnea and cyanosis, lasting seven weeks.—Reprinted through the courtesy of Charles C. Thomas, Publisher, Springfield, Illinois.—Roswit, B., Kaplan, G.: "The role of nitrogen mustard as a systemic adjunct in the radiation therapy of certain malignant diseases," *Am. J. Roent. and Radium Therapy*, 61: 1949.

damage to the hematopoietic system. Leukopenia, thrombocytopenia and anemia may be encountered. Frequent blood studies including bone marrow puncture are therefore desirable precautions. Marked bone marrow depression must be regarded as a contraindication to HN_2 therapy. Other toxic reactions, local and systemic, were reported in detail in earlier communications.[20,21,27] In general, the reaction of the peripheral blood and bone marrow to the impact of HN_2 appeared far less severe than in patients with malignant lymphomas.

Neither conventional radiation nor intravenous nitrogen mustard has been particularly helpful in maintaining control over persistent accumulation of pleural effusion. Karnofsky et al.[23,28] have injected nitrogen mustard directly into the pleural space with encouraging results in a few selected cases. We have given this technique a preliminary trial and have found it promising. Doses from 5 to 20 mg. of HN_2 are injected at weekly intervals after first withdrawing most of the accumulated fluid. Systemic toxic symptoms may be expected in most cases. We have considered injecting HN_2 directly into the pulmonary artery at time of exploratory thoracotomy, whenever the malignant process was found inoperable.

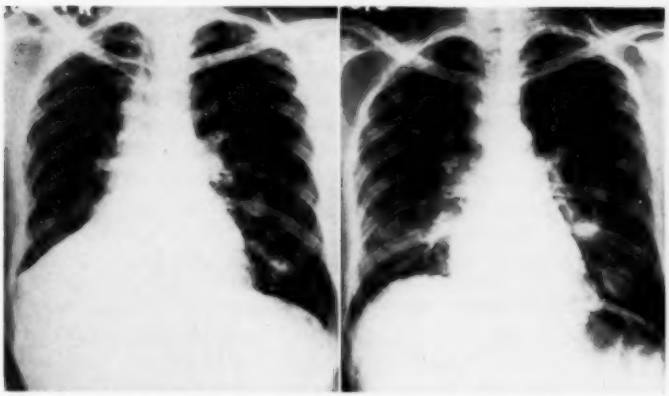

FIGURE 6a FIGURE 6b

Case 7, Figure 6a: Carcinoma of the lower lobe bronchus, with atelectasis, mediastinal nodal enlargement, and metastatic deposits in both lung fields.—*Figure 6b:* After a single course of HN_2 therapy, note roentgen evidence of relief of bronchial obstruction but enlargement of metastatic deposits in both lung fields. Patient experienced clinical improvement, gain in weight, strength and appetite, and relief from fever and dyspnea.—Reprinted through the courtesy of Charles C. Thomas, Publisher, Springfield, Illinois.—Roswit, B., Kaplan, G.: "The role of nitrogen mustard as a systemic adjunct in the radiation therapy of certain malignant diseases," *Am. J. Roent. and Radium Therapy*, 61: 1949.

Oral nitrogen mustard (triethylene melamine) TEM*—has been employed by Karnofsky et al.,[29] but their results in five cases of inoperable advanced postirradiated cancer of the lung were equivocal. In one other instance the patient was entirely relieved of pain, dyspnea, and cough, and has been doing well for three months. This agent is provided in 5 mg. tablets and given in doses of 2.5 to 5 mg. daily or tri-weekly in a single dose about one hour before the morning meal. A "course" of treatment consists of 20 to 40 mg. in three to five weeks. Here, too, as in therapy with intravenous nitrogen mustard, one must follow the WBC, Hgb, and platelets at weekly intervals because severe bone-marrow depression is an inevitable consequence of overdosage. An important difference between intravenous HN_2 and oral TEM, according to Karnofsky and his colleagues, is that, while HN_2 is given rapidly (four days) with striking responses, TEM is given more slowly (two to four weeks) with moderate and more prolonged alleviation of symptoms. The distinct advantage of TEM lies in the opportunity to treat patients on an ambulant basis in office or clinic practice without the severe nausea and vomiting one encounters in about 50 per cent of patients treated with intravenous HN_2.

When one compares the results of roentgen therapy and nitrogen mustard, the superiority of radiation becomes abundantly clear. Remissions are much longer and severe systemic reactions far less than with nitrogen mustard therapy. The cumulative, severe and irreversible trauma to the bone-marrow which follows repeated courses of HN_2 or TEM makes the use of these agents unjustified in relatively early cases.

It is important to emphasize, at this point, that radiation is the only non-surgical treatment which can be delivered in cancerocidal doses. Therefore, roentgen therapy should always be given first consideration, particularly in patients with localized lesions.

3) *Palliative Surgery:*

The person who presents a fairly well circumscribed tumor which is the site of necrosis, cavitation and abscess, giving rise to severe local and constitutional symptoms, is sometimes best served by palliative resection of the lesion. The striking advances in thoracic surgical technique, anesthesiology, and chemotherapy in the past five years have sharply reduced the morbidity and mortality of lobectomy and pneumonectomy to a reasonably low level.[30,31] An exophytic endobronchial lesion occluding a main bronchus, or overlying the carina may be repeatedly fulgurated

*Lederle Laboratories.

via the bronchoscope to provide aeration and drainage. Painful metastatic skeletal lesions, if unresponsive to radiation, are sometimes resectable.

Modern neurosurgery has much to offer the patient with inoperable bronchogenic carcinoma suffering from intractable and incapacitating pain. After a critical analysis of the type of pain, its distribution and etiological factors, the surgical course of action is chosen. Focal pain of pleural or intercostal origin is best given a therapeutic trial of intercostal nerve block employing procaine or metycaine. If successful, a subsequent neurectomy of the intercostal nerve is generally performed. Phrenic nerve resection may relieve pain arising from invasion of the diaphragm.

One of the most effective and inclusive palliative procedures is a posterior rhizotomy, sectioning the involved nerve roots. However, if the distribution of pain involves the cervical roots, especially C_5 to T_1, posterior rhizotomy is precluded, since one dare not denervate the upper extremity with attendant loss of position sense and impairment of useful function.

If the painful area is wider in scope but below the level of T_7, then a cordotomy may be useful. This is usually done at the level of T_2-T_3, sectioning the antero-lateral spinothalamic tract. Thus all pain is relieved for four to five segments below the incision. When pain originates above T_7, a cervical cordotomy is indicated but this is a technically hazardous procedure. For bilateral pain, a bilateral cordotomy may be performed at lower levels in two stages or in one procedure. If the pain is well-defined in character and distribution, even though extensive, the results of cordotomy are universally successful. Patients with the Pancoast type of pulmonary neoplasm, which invades the cervico-brachial plexus and the thoracic cage, are most frequently in need of the neurosurgeon's skill for relief from intractable pain in the shoulder girdle and upper extremity.

In patients with extensive disease and much pain one has to consider unilateral pre-frontal lobotomy, which will give relief from pain of any kind or distribution. After this procedure the patient experiences pain but is relatively indifferent to its implications, because its emotional components are suppressed. He therefore eats well, sleeps well, gains weight and strength, and may return to almost normal activity. Scarff[32] has recently reported that he performed unilateral pre-frontal lobotomy in 58 patients for the relief of intractable pain. In the majority of the cases the pain was secondary to inoperable carcinoma. Good results were achieved in 66 per cent, fair in 20 per cent, and poor in 14 per cent. There was no mortality and little morbidity despite the fact that many of these patients were bad surgical risks. Scarff[32]

found that the effectiveness of this procedure was permanent for pain of constant severity. In our own cases we have found the results of this palliative procedure truly gratifying. After prefrontal lobotomy, the individual no longer needs narcotics, and these may be interrupted at once without severe withdrawal symptoms. If a unilateral procedure fails or begins to lose effectiveness, the opposite side may be sectioned. It is of interest that this procedure is technically relatively easy and has been performed in some of our most severely ill patients.

4) *Palliative Medical Measures:*

The palliative measures to be discussed here are intended to supplement radiation, nitrogen mustard and surgery in providing a reasonable degree of relief from distressing and incapacitating symptoms, foremost among these being pain, cough, dyspnea, malnutrition, and the constitutional symptoms of suppuration of the lung. These measures will be discussed in direct relation to the progressing life history of the malignant process.

Intraluminal tumor proliferation, bronchial obstruction, pulmonary infection, local invasion of contiguous structures and distant metastases generally follow each other in an integrated pattern attended by the associated symptomatology.[33] The malignant process runs its course within less than two years in the majority of the cases. The immediate cause of death in our patients was due to hemorrhage, asphyxia, pulmonary edema, cachexia, toxemia of infection, or metastatic cancer.

Seventy per cent of our cases had proliferating neoplasms in the main-stem bronchi.[33] Cough, dyspnea and wheezing, and hemoptysis were thus among the most common of the presenting symptoms. Unless relieved by focal roentgen radiation, nitrogen mustard therapy, bronchoscopic fulguration, or more rarely by radon seed implantation, these symptoms grew steadily worse. Under these conditions, drugs acting upon the bronchi and their secretions, including aminophyllin, ephedrine, neosynephrine, etc., were occasionally helpful. Steam inhalations, codeine, and carbon dioxide inhalations have also proved useful in relieving harassing cough.

Bronchial obstruction was usually followed by obstructive pneumonitis, bronchopneumonia, bronchiectasis, or abscess formation, and was accompanied by fever, chilly sensations, sweats, malaise, anorexia, weight loss, and productive cough. At this stage most of the difficult problems of palliative management have their origin. Only re-establishment of adequate drainage through the bronchial lumen and control of infection can bring about effective relief. If radiotherapy, HN_2 or TEM are unfeasible or ineffective,

some benefit may be obtained from bronchodilator drugs, postural drainage, steam inhalations and antibiotics. Expanding circumscribed tumors, especially the peripheral type, soon became centrally necrotic and secondarily infected. These lesions did not respond well to x-ray treatment, nitrogen mustard, or antibiotics. They are best subjected to palliative resection, if feasible.

Rapid accumulation of pleural fluid must be relieved by repeated thoracentesis. The recent observations of Karnofsky, et al.[23,28] on the intrapleural use of HN_2, supported by our own experience, promise some relief from this complication. Serious hemorrhagic episodes can, on occasion, be controlled by massive single and repeated doses of roentgenray therapy. If bleeding is fulminating, lobectomy may be indicated as an emergency life-saving procedure.

Regional invasion of contiguous structures and distant metastases frequently produced intractable pain which became the most serious incapacitating symptom. Relief of pain was then the most pressing consideration. We have carefully limited the use of narcotics as long as possible, because drug addiction greatly complicates medical management. If narcotics must finally be used, one should resort to the newer agents such as dromoran, demerol, methadon, metopon, and levo-isomethadon. Alternation of these drugs helped to lessen the risk of drug addiction and rising tolerance. Dromoran, in particular, appears to be the most promising of this group. Keutmann and Foldes[34] have recently reported that the action of this drug was not only more prolonged than morphine, but that the first dose afforded relief in approximately 35 per cent more of the cases than did morphine under the same conditions.

For pain arising from pleural and intercostal invasion, ethyl chloride spray can be temporarily useful, to be followed by the more permanent surgical interruption of the involved intercostal nerve. In some instances, intravenous procaine will give relief for several days. The intravenous use of ethyl alcohol in 5 to 10 per cent concentration for relief of intractable pain can be very effective, according to a recent report by Karp and Sokol.[35] We have given two liters of 5 per cent alcoholic solution in 24 hours. The rate of flow is such that the first 200 cc. are infused in 30 minutes, after which the flow is slowed to 60 drops per minute.

We have occasionally observed compression of the esophagus by enlarged hilar lymph nodes, simulating primary esophageal carcinoma. If x-ray therapy is ineffective here, gastrostomy may be indicated. Since intracranial metastases are relatively common late in this disease, hemiplegia and other neurological catastrophes have been observed at this period. Only rarely can conventional radiation achieve a favorable remission in such instances. Super-

voltage x-rays, Marks "grid" technique, and rotation radiotherapy will probably prove more effective. Such evidence is already at hand.[17]

As the neoplastic disease becomes more advanced, anorexia, malnutrition, and finally cachexia become the principal reasons for disability and truly difficult to control. At this time, when his nutritional needs are actually augmented the patient eats less because of anorexia. As a consequence of this caloric deficit, ingested protein is partly utilized for energy and thus is not available to replace lost tissue. The result of this unfortunate chain of events is a negative nitrogen balance, progressive loss of weight, weakness, anxiety, restlessness, and above all, further anorexia which decreases still more the already inadequate food intake.

In the management of this vexing problem we have had little success with the conventional oral and parenteral nutritional regimen. Special high protein and high carbohydrate diets enhanced by judicious use of the newer amino-acid supplements, administered intravenously or orally, have been found more effective. Pre-prandial brandy or whisky has helped to stimulate appetite and a sense of well-being. With this regimen, we have met protein requirements up to 250 grams daily. It is worth mention, in passing, that whole protein by mouth appears to be better utilized than intravenous amino acids, because much of the latter may be lost via the kidneys. We attempted to meet glucose requirements in order to minimize depletion of liver glycogen, to spare body protein, and to prevent ketosis.

Fat contains nine calories per gram, and can be made more palatable by fine emulsification. In this manner, a large number of calories can be given in a small volume with a minimum of discomfort by the oral route. Of special interest in this connection is the observation of Forbes and Swift[37] that dietary fat "spares" protein for tissue replacement much more effectively than does a comparable amount of carbohydrate. These were the considerations which prompted Shoshkes, Van Itallie, Geyer and Stare,[36] to investigate the oral use of homogenized peanut oil, of which an 8 oz. glass supplies as much as 1,000 calories.* They observed striking rapid gain of weight, strength and well-being in malnourished sick individuals, including several with advanced malignant disease. These investigators[36] noted in such patients gains in weight of as much as six pounds in the first week. The longer a patient used the emulsion, the more weight he gained. Nineteen per cent of this group reported a very marked increase in appetite, described as a "constant urge to eat all day long." This increase

*Lipo-mul oral (Upjohn).

of appetite, when it occurred, ordinarily persisted for at least several months after use of the emulsion was discontinued. Special fat emulsions for intravenous administration have been prepared by Stare and his associates. In our opinion, these are among the most important contributions of recent years toward the maintenance of well-being of malnourished individuals with cancer and other debilitating diseases.

The negative nitrogen balance which plays such an important role in the cachexia of our patients can be favorably influenced by daily intramuscular injections of testosterone. Our experience indicates that hirsutism, acne, change of voice and other masculinizing changes so frequently encountered in breast cancer patients receiving testosterone, are much less frequently seen in our female patients with bronchogenic carcinoma. Caution must be observed in the prolonged use of testosterone because loss of body fat and serious disturbances in fluid and electrolyte balance may take place. In the cardiac patient, the latter may lead to congestive heart failure. Mineral and vitamin dietary supplements are supplied orally.

Metastasis to the adrenal gland, accompanied by symptoms of hypo-adrenalism, is common late in the course of bronchial carcinoma. In such instances radiation and HN_2 are ineffective. Adrenal cortical extracts, supplemented by sodium chloride and DOCA, have proved useful.

Cortisone is the most recent addition to the armamentarium of adjuncts for the treatment of advanced malignant disease. Straus and his associates[38] recently reported marked improvement of well-being, appetite, weight and strength in a group of patients with Hodgkin's disease during the administration of cortisone, 200 mg. daily. These important benefits were regarded as entirely non-specific, representing only suppression of the systemic manifestations of toxicity and inflammation, notably fever, malaise, toxemia, anorexia, and weight loss. During those periods when bone-marrow depression, with leukopenia and anemia, made the use of roentgen-therapy and HN_2 hazardous, cortisone helped greatly to stimulate bone-marrow activity, producing a marked increase in cellularity. It is of special interest that the toxic effects of nitrogen mustard on the gastro-intestinal tract were alleviated in some cases by concomitant use of cortisone.

SUMMARY

1) The significant and growing number of new patients with inoperable bronchogenic cancer makes it mandatory that every new palliative measure be employed to contribute toward the

maintenance of their comfort and useful activity during the relentless downhill progress of their disease.

2) Recent advances in widely varied fields of therapy have made possible newer palliative measures which provide amelioration of intractable symptoms, prolongation of useful life, and even a rare chance for cure.

3) The authors have assembled them here and have presented, as well, their combined experience with several hundred patients in the use of radiation therapy, the nitrogen mustards, thoracosurgical and neurosurgical procedures, and a variety of newer palliative medical measures. Radiation therapy, in particular, has provided the most effective and the most prolonged palliation. This agent gives real promise of becoming even more useful in the near future.

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RESUMEN

1) El importante y constantemente creciente número de pacientes con cáncer broncogénico inoperable hace obligatorio que toda nueva medida paliativa sea empleada para contribuir hacia la conservación de su comodidad y actividad útil durante el irreversible y descendente progreso de su enfermedad maligna.

2) Adelantos recientes en amplios y variados campos de la terapia han hecho pósibles más nuevas medidas paliativas que producen mejoramiento de los síntomas, prolongación de la vida útil y alguno que otro caso de curación.

3) Los autores los han reunido aquí y han presentado también su experiencia conjunta con varios cientos de pacientes, en el uso de la terapia por radiaciones, las mostazas de nitrógeno, procedimientos tóraco-quirúrgicos y neuro-quirúrgicos, y una variedad de nuevas medidas médicas paliativas. La terapia por radiaciones, en particular, ha proporcionado la más efectiva y prolongada paliación. Este agente ofrece realmente una promesa de llegar a ser aun más útil en un futuro próximo.

RESUME

1) Le nombre important et nettement croissant des malades atteints de cancer bronchique inopérable exige l'utilisation de tout nouveau traitement palliatif. C'est ainsi que l'on contribuera à maintenir une vie possible et même une activité utile à ces malades chez qui évolue progressivement la maladie.

2) Récemment, les progrès de la thérapeutique dans des branches très variées ont permis que soient utilisées de nouvelles méthodes palliatives. Grâce à ces méthodes, on peut compter obtenir une amélioration des symptômes, la prolongation d'une existence utile, et, rarement, même la possibilité de guérison.

3) Les auteurs ont groupé ces différents moyens de traitement et ont présenté les résultats de leur expérience, portant sur plusieurs centaines de malades. Ils ont utilisé la radiothérapie, le gaz moutarde, des procédés de chirurgie thoracique et de neurochirurgie, et quelques autres moyens thérapeutiques plus nouveaux. C'est plus spécialement la radiothérapie qui a donné les effets palliatifs les plus remarquables et les plus prolongés. Ce procédé nous promet de meilleurs résultats encore dans un proche futur.

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Deficiencies in Our Knowledge of BCG Vaccine*

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In view of the great interest in the subject of BCG as a prophylaxis against tuberculosis, and in view of its experimental use in the United States, it is important that the status of this vaccine be clarified.

Although BCG has been in use experimentally since 1906 and has been used on human beings since 1922, a great many important facts concerning it are still lacking. It would appear that considerable further knowledge is needed before this vaccine can be accepted as a general public health measure in the United States or even licensed for production by commercial laboratories.

No method has been developed for stabilizing the potency of the vaccine. No means has been developed to assure that similar amounts of BCG from different laboratories would have equal numbers of viable organisms and equal potency. We still have no knowledge of the actual degree of immunity conferred by the vaccine, or the duration of this immunity. We are not agreed on the optimal dosage to be given or the best method of administering the vaccine.

In spite of this lack of knowledge, there are those who would permit the production of BCG by commercial laboratories. Recently the United States Public Health Service licensed the Research Foundation of the University of Illinois for the "manufacture, exportation, importation, and sale" of BCG; but it was stated at the same time by Dr. Robert Anderson, Chief of the Tuberculosis Division of the Public Health Service,[1] that BCG cannot be considered an absolute preventive against tuberculosis and that efforts are still being made "to find more stable and suitable immunizing agents." It was also recommended that the use of the vaccine be limited to "those persons who are particularly vulnerable to exposure," such as those exposed by occupations: physicians, nurses, medical students, social workers, etc. This opinion on the use of BCG today is the same as that recommended by the American Trudeau Society.[2]

Recently it was pointed out by Anderson and Palmer[3] that, if the liquid BCG vaccine were licensed today, it would be the most unstable vaccine so licensed in the United States.

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It has been demonstrated that the effectiveness of BCG vaccine depends on the number of viable organisms in the solution.[4] The first difficulty to overcome, therefore, is the rapid loss of viable organisms in the prepared vaccine.

Dr. Renee Dubos of the Rockefeller Institute,[5] who has made numerous studies on the BCG organism as well as on the vaccine, has stated that in studies on BCG vaccine from the respective laboratories in the United States he has found a loss of as many as 90 per cent of the viable organisms in the first 24 hours after preparation if the vaccine is not kept under constant refrigeration. For these examinations, specimens for counting were taken directly from the original tubes.

Aronson and Schneider[6] also report a "significant decrease in the number of viable organisms kept from five to seven days at either 4 or 20 degrees C." They recommend that BCG be used within four to five days after its preparation.

Jensen[7] likewise reported a marked decrease in the virulence and number of viable bacilli after storing BCG for two, five and 11 days at 2 and 18 degrees C.

The reason for this rapid decrease in the number of viable BCG organisms in the prepared vaccine has not as yet been determined. Jensen[7] was of the opinion that it was due to the presence of copper in the water used in preparing the BCG suspension. This has been disproved by Aronson.[6] Dr. Dubos is of the opinion that the loss in viability may be due to traces of detergents or soaps which are almost impossible to remove from the glassware.

Both Aronson[6] and Birkhaug[8] agree that, because of this rapid loss in number of viable bacilli, the BCG vaccine must be used within several days after its preparation, although this prevents an adequate determination of purity, number of viable organisms, tuberculogenic potency, virulence and protective value.

Attempts at adequately stabilizing the potency of fresh vaccine by lyophilization have so far been unsuccessful, cultures showing a decrease of approximately 90 per cent in the number of viable organisms immediately after lyophilization.[6,8] However, Birkhaug[8] has demonstrated that the number of living elements remaining in the vaccine after lyophilization continue unchanged for more than a year when stored at 2 to 4 degrees C.

Birkhaug[9] has further demonstrated in animal experiments that by quadrupling the multiple skin punctures, the use of one-year-old vaccine, either the dry glucose BCG or the frozen glucose vaccine, produced a degree of resistance to virulent tubercle bacilli comparable to that obtained using fresh liquid vaccine and one-fourth the number of skin multiple punctures.

In 1950 Dubos and Fenner[18,19] demonstrated that BCG grown

in a liquid medium containing Tween 80 and a filtrate of heated human serum retained their viability after six weeks storage in a refrigerator.

More recently Fenner[20] has reported that BCG cultures grown in Tween 80 albumin medium maintained their viability almost completely for at least four months, whether stored in a refrigerator or held at room temperature.

Perhaps, at some future time, such dry or frozen vaccine may be so prepared as to furnish an adequate number of viable organisms to make its general use practical. Perhaps some method similar to that suggested by Dubos and Fenner may be found to maintain the number of living organisms in the liquid vaccine for much longer periods of time than can be accomplished with our present methods.

But the rapid loss of viability is not the only problem confronting the investigator in his studies of BCG. The marked variation in the potency of the same amount of vaccine from different laboratories is also open to further investigation.

According to Suter and Dubos,[10] if a specified amount of BCG from three different laboratories is inoculated into the skin of guinea pigs, there is found to be a specific difference between each vaccine not only in the size of the local lesion, but in the persistence of the lesions as well. In a further experiment, Suter and Dubos[10] injected larger doses of BCG from the three different laboratories intraperitoneally into guinea pigs. Here also there were marked differences in pathological findings. The mesenteric nodes were swollen in guinea pigs infected with strains I and III, but normal in those receiving strain II. Only strain III caused enlargement of the spleen, whereas the largest macroscopically visible lesions in the lung were found in animals infected with strain I. Lesions elicited by culture III were smaller in size and number, whereas no lesions were found in animals injected with culture II.

Microscopically, the number and size of the lesions in the lung and the intensity of the cellular reaction in the regional lymph nodes and spleen were characteristic for each strain. Moreover, the cultural characteristics of the three strains vary greatly to such a degree that they may be differentiated by comparing test tubes containing the cultures. When inhibitory substances are used on BCG from different laboratories, there is an individual and marked difference in the susceptibility of the three strains.

In further studies at the Rockefeller Institute, Dr. Werner Scheffer,[5] using BCG vaccine from four different sources (Phipps Institute; Tice Institute; New York State Department of Health; and Copenhagen), found that the local lesions caused by the

individual vaccines differed markedly, even when the same number of living bacilli were inoculated. It is interesting to note that a given number of living BCG organisms from one laboratory produced a local lesion equal in size to that of 27 times the number of living BCG organisms from another laboratory.

In other words, judging from these reports, there is at present no way of assuring that exactly similar amounts of BCG from different laboratories would have an equal degree of potency.

But what do we infer when we use the word potency? The potency of a vaccine should not be judged by the size of the local lesion produced after inoculation but on the degree of immunity it confers. Once again our knowledge on this critical point is sorely lacking.

We feel that the BCG vaccine is capable of conferring a partial immunity on those inoculated, but a degree of immunity far below that attained by the use of diphtheria or tetanus toxoid or through smallpox vaccination. The exact degree of immunity received from BCG and the duration of this immunity are not as yet determined. Most workers have assumed that the immunity acquired from BCG vaccination endures as long as the skin retains the tuberculin sensitivity which follows the vaccination. But the duration of a positive tuberculin reaction following vaccination varies greatly even when a single sample of the vaccine in equal dosage is given to a group of tuberculin negative individuals.

A further question has arisen concerning a possible difference in immunizing qualities of the vaccine in different racial groups. It has been suggested for example that the vaccine has greater activity when given to Negroes than when given to those of white origin. The difference in tissue reactions of white and Negro children to BCG inoculation has been reported,[11] but to date no study has been reported which makes a comparison of the degree of immunity.

The optimal method by which the BCG vaccine should be used is also open to question. The oral method of vaccination used originally in Europe and in experimental work in the United States was discarded when it was shown that less than 60 per cent of those vaccinated developed positive tuberculin reactions as compared to over 90 per cent when vaccinations were performed parenterally.[12,13] In spite of these findings, BCG is still being given orally in Russia and in Brazil.

Parenterally, the vaccine has been given with few exceptions either by the intradermal method or by the multiple puncture method using either the Rosenthal or the Birkhaug technique. In an attempt to evaluate these methods, one again finds conflicting reports.

Hertzberg,[14] on the basis of studies made in Oslo, states that "a comparison of the persons vaccinated by the intracutaneous method with those by the Rosenthal method shows that the duration of vaccination allergy is longest after the former."

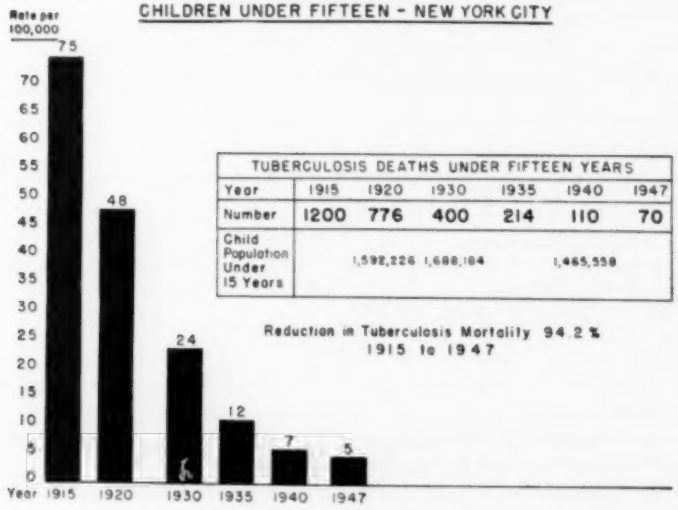
On the other hand, in the annual report of the BCG Laboratory at Bergen, Norway, in 1948, Johannes Boe[15] states: "It is apparent that the results of tuberculin positive conversions are considerably better as regards the multiple puncture method."

However, in spite of this extreme lack of knowledge concerning the BCG vaccine, it is being widely used in many countries throughout the world. Why, then, has it not been adopted for general use in the United States? The answer is clear. In the United States, anti-tuberculosis measures such as case detection, separation of contacts, hospitalization, mass x-ray studies, removal of tuberculin positive cows, and pasteurization of milk have attained a high degree of success.

One might take the city of New York with its crowded living quarters, with a Negro population of over 540,000 as well as a large Puerto Rican population. In 1915, there were 1,200 deaths from tuberculosis among children under the age of 15 years (81 per 100,000). In 1948, the tuberculosis deaths among this age group had dropped to 74 (4 per 100,000), a fall of over 95 per cent—and this during a period when only the usual anti-tuberculosis methods

FIGURE 1

TUBERCULOSIS DEATH RATE
CHILDREN UNDER FIFTEEN - NEW YORK CITY



TUBERCULOSIS DEATHS UNDER FIFTEEN YEARS						
Year	1915	1920	1930	1935	1940	1947
Number	1200	776	400	214	110	70
Child Population Under 15 Years		1,592,226	1,688,184		1,465,558	

Reduction in Tuberculosis Mortality 94.2 %
1915 to 1947

were being used. These figures are superior to any published from countries or localities claiming the benefit as due to BCG inoculation. In the United States as a whole, the tuberculosis mortality has dropped from 202 per 100,000 in 1900 to only 22.2 per 100,000 in 1950.

We can readily realize why a prophylactic measure, although providing only a partial immunity and although far from perfected when compared with other immunizing agents, should be grasped at by countries where other anti-tuberculous measures are difficult to carry out.

Bueno,[16,17] in describing efforts towards the control of tuberculosis in Brazil, writes: "Because we do not have sufficient beds to isolate the sick, we try to use some more economical measure which for us is more practical. In view of this situation," he adds, "the majority of specialists in Latin America and especially in Brazil favor vaccination with BCG."

It would appear that considerable further knowledge concerning BCG is necessary before it is accepted generally in the United States as a public health measure or before its manufacture is licensed to commercial organizations. Added knowledge is necessary on: a) the actual degree of immunity conferred by the BCG vaccine; b) the duration of immunity following vaccination; c) the optimal method of administering the vaccine; d) the effectiveness of the vaccine in different racial groups with various degrees of resistance; and most important of all, e) a means of stabilizing the potency of the vaccine.

The BCG vaccine can in no way be offered as a substitute for other anti-tuberculous methods so successfully used in this country.

Until the necessary knowledge concerning BCG is obtained, it would seem advisable to continue its use on an experimental basis, limiting it to the inoculation of individuals where tuberculosis exposure is likely to occur, such as medical students, nurses, individuals from tuberculous homes, and also in selected population areas with high tuberculosis mortality rates.

Acknowledgment: I should like to gratefully acknowledge the assistance of Mr. Godias J. Drolet, Statistician of the New York Tuberculosis and Health Association, in the preparation of the statistics on the tuberculosis death rate in New York City.

SUMMARY

1) No method has been developed for stabilizing the potency of BCG vaccine.

2) No method has been devised for preventing the rapid decline of viable organisms in the freshly prepared vaccine.

3) A marked variation in potency as well as in number of viable

organisms exists in similar amounts of BCG from different laboratories.

4) The exact degree of immunity received from BCG and the duration of this immunity are not as yet determined.

5) Adequate knowledge is lacking concerning possible differences in immunizing qualities of the vaccine in different racial groups.

6) The optimal method of BCG vaccination is still open to question.

7) BCG vaccination should not be offered as a substitute for other anti-tuberculosis methods so successfully used in the United States.

Conclusion

Considerable further knowledge is needed before BCG vaccination can be accepted as a general health measure in the United States, or even licensed for production by commercial laboratories.

RESUMEN

1) No se ha desarrollado ningún método para estabilizar la potencialidad de la vacuna BCG.

2) No se ha ideado ningún método para prevenir la declinación rápida del organismo, viable en la vacuna recién preparada.

3) Una variación marcada en potencialidad, así como en el número de gérmenes viables existe en cantidades similares de BCG proveniente de diferentes laboratorios.

4) No se ha determinado el grado exacto de la inmunidad proporcionada por el BCG, ni la duración de ella se ha precisado.

5) Falta conocimiento adecuado de las diferencias de las propiedades inmunizantes del BCG en diversos grupos raciales.

6) Está en cuestión aun el método óptimo de vacunación con BCG.

7) La vacunación por el BCG no debe ofrecerse como un substituto de otros métodos antituberculosos usados con tanto éxito en los Estados Unidos.

8) Se necesita conocer más sobre ella, antes de que la vacunación con BCG pueda ser aceptada como medida de salud general en los Estados Unidos, o aun para que se permita su producción por laboratorios comerciales.

RESUME

1) Onn'a décrit aucune méthode qui permette de stabiliser l'efficacité du B.C.G.

2) Aucune méthode n'a été mise au point pour empêcher la perte rapide de la vitalité des bacilles, telle qu'elle existe dans le vaccin qui vient d'être préparé.

3) Ll existe une variation nette aussi bien dans l'efficacité que

dans la quantité des bacilles vivants dans des quantités égales de B.C.G. provenant de laboratoires différents.

4) L'exact degré de l'immunité obtenue grâce au B.C.G. et la durée de cette immunité n'ont pas jusqu'à présent été déterminés.

5) Nous manquons d'éléments pour estimer les différences possibles de l'immunité conférée par la vaccination selon les groupes ethniques dans lesquels elle a été utilisée.

6) La meilleure technique de vaccination par le B.C.G. est encore discutée.

7) La vaccination par le B.C.G. ne peut pas être considérée comme une méthode capable de remplacer les autres moyens de lutte antituberculeuse qui ont été employés avec tant de succès aux Etats-Unis.

8) Des connsissances ultérieures considérables sont nécessaires avant d'utiliser la vaccination par le B.C.G. en tant que mesure générale aux Etats-Unis ou même pour autoriser la production de ce vaccin par des entreprises commerciales.

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Experience with High Doses of Para-Aminosalicylic Acid in the Treatment of Pulmonary Tuberculosis*

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This study was an attempt to determine whether the administration of large doses of para-aminosalicylic acid, 18 to 24 grams a day, was feasible and advantageous in the treatment of pulmonary tuberculosis. Patients for this study were not especially selected. Each one for whom antibacterial therapy was indicated and who had an odd hospital register number, between May 24, 1950 and January 1, 1951, was placed on 24 grams of PAS daily. In addition, six whose sputa showed organisms definitely resistant to streptomycin were added to the study. This made a total of 28 who were started on the proposed therapy. In six of the patients, collapse measures were added sometime during the course of treatment.

The 28 included 22 with far-advanced and six with moderately advanced pulmonary tuberculosis. All had progressive, or at least stationary lesions. Seventeen were white and 11 were negro. All were males, 12 of whom were in the third decade of life, nine in the fourth decade, two in the fifth, four in the sixth and one in the seventh. All had positive sputum, on concentration, at the beginning of therapy. PAS was given in the form of sodium salt, prepared in our pharmacy according to the method described by Lyght.[1] The equivalent of 6 grams of PAS was administered four times daily with food for a proposed period of 120 days.

Of the 28 begun on 24 grams of PAS, only 12 (42.8 per cent) completed the course of 120 days. However, six others were able to complete the course after the daily dose was reduced to 18 grams. This makes a total of 18 (64.2 per cent) who were able to tolerate high doses of PAS for 120 days. Almost all developed some symptom of drug toxicity, mainly anorexia, vomiting, or

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diarrhea. In most, however, the omission of the drug for a day or two was sufficient to alleviate the symptoms and permit the prompt resumption of therapy. On the other hand, in three, these symptoms were so severe as to warrant the cessation of therapy within the first month. In another, the drug had to be stopped after three weeks because of the appearance of chills, high fever (up to 105 degrees F.) and malaise after each dose administered. Thus, 14.3 per cent of our patients were unable to tolerate high doses of PAS sufficiently long to enjoy the benefits of any significant therapeutic effect.

Six other patients remained on the course for at least two months, but failed to complete the 120 days. Two of them appeared to show poor therapeutic response by the end of the third month, and a different regimen was substituted. In two others, high dosage PAS was discontinued after two and one half months in one and three months in the other, because tubercle bacilli obtained from their sputa showed well marked resistance to PAS by in vitro tests. The fifth patient left the hospital without our consent after two and one half months of therapy, and the sixth, after a similar period, suddenly refused to take all medications without offering any explanation.

Weight loss occurred in 54.2 per cent of our group, probably as a result of the gastro-intestinal dysfunction produced by the large doses of PAS, (Table I).

TABLE I

Weight Changes in Patients on 18-24 gms. of PAS for 2 to 4 Months

		— LOSS IN POUNDS —			— GAIN IN POUNDS —			
		Less Than 5	5-10	More Than 10	Less Than 5	5-10	More Than 10	No Change
Total Number	24	6	4	3	3	1	5	2
Per cent	100	25	16.7	12.5	12.5	4.2	20.8	8.3

In view of the tendency of patients on PAS to develop frequent loose stools, there was some question whether the drug was adequately absorbed and whether the increased dosage led to increased blood levels. Blood samples, therefore, were drawn at specified hours after ingestion of the drug from five patients taking 24 grams daily, and for comparison from five patients taking 12 grams daily. The results obtained, (Table II), indicate marked variation between patients on the same dose, but on the average the blood levels were higher at the third and fourth hours after ingestion in those who were taking 24 grams daily.

TABLE II

PAS Blood Levels, After Ingestion of First Morning Dose

	1 HOUR	2 HOURS	3 HOURS	4 HOURS
12 grams (3 gm. dose)	9.4 7.6 6.0	6.9 3.3 0	13.1 6.2 0.4	2.6 1.4 0.4
24 grams (6 gm. dose)	9.2 7.0 0.5	7.8 5.6 0.3	23.0 14.5 9.8	11.7 8.2 3.5

The lower left figure in each box is the lowest value obtained, the upper right figure is the highest, and the center figure is the average.

A few of our patients seemed to develop streaked sputum more frequently than expected. The prothrombin level was, therefore, determined in 15. In six (40 per cent), of those tested, the level was 60 per cent or less of normal. In 10 others, not on PAS, the level was 100 per cent without exception. Probably the reduction in level in those on large doses of PAS, is due to interference with prothrombin formation, in a manner similar to the action of other salicylates, and most markedly, of dicumarol. The administration of one of the Vitamin K preparations brought a return to normal level within a few days.

The various complications encountered, and the apparently mediocre results obtained, as compared to combined therapy, made us bring the study to a halt. Thus the number of patients treated are too few to permit of anything more than an impression. Our immediate results are tabulated in Table III, and for comparison the results obtained by the British Medical Research Council[2] in a series of 59 cases of acute progressive bilateral tuberculosis treated with 20 grams of PAS daily for a period of three months without any concomitant collapse measures, is included.

TABLE III

Immediate Results of 2-4 Months of 18-24 gms. PAS

		X-Ray Improvement (Per cent)		Sputum Conversion (Per cent)	
	No. Cases	All Degrees	Moderate or Marked	Culture	Smear
BMRC	59	47.5	8.5	27	50
Kennedy	24	62.5	29.2	25	41.7

In Table IV, the results obtained in the two series, six months after the start of therapy, are compared. The number diminished

by five because three went on to receive major surgical measures during the follow-up period while two left the hospital against advice and have not been followed.

TABLE IV

Results of 18-24 gms. PAS, 6 Months After Beginning of Therapy

		X-Ray Improvement (Per cent)		Sputum Conversion (Per cent)	
	No. Cases	All Degrees	Moderate or Marked	Culture	Smear
BMRC	59	27	23	13	43
Kennedy	19	47	32	32	53

There are a number of competent investigators, especially among surgeons,[3] who believe that previous treatment with streptomycin makes major operative procedures more hazardous and more productive of severe complications. Although we cannot agree with the above opinion,[4] there is little doubt that better results are obtained if patients are turned over to the surgeons when they are still amenable to treatment with streptomycin during the operative and post-operative periods. In our group of cases, there were 10 with lesions that, at the start of treatment with PAS alone, appeared as if they would require major surgery. One of these closed his cavities and converted to negative sputum with the aid of pneumoperitoneum and phrenemphraxis. Two patients, failures of previous streptomycin therapy, failed to improve sufficiently with PAS to permit of surgical treatment. Another improved sufficiently clinically that thoracoplasty was approved at Conference, but he refused to accept the operation. The remaining six consisted of two white and four negro patients. In them, four thoracoplasties, one extra-pleural leucite plombage, and one segmental resection and partial thoracoplasty were performed. One of the thoracoplasty cases had a series of massive hemoptyses following the first-stage, and expired,—our first thoracoplasty death in more than four years. Another went AWOL before the series of stages of thoracoplasty were completed. Of the remaining four, two are now persistently negative on concentration. The resection case still has occasional positive smears. One with thoracoplasty still has a residual cavity beneath the thoracoplasty. None of these four had post-operative spreads of disease.

Another observation of interest was the not infrequent emergence of strains of bacilli resistant to PAS, during the course of therapy. In the 19 whose sputa were still positive at the conclusion of therapy, seven (39 per cent) showed bacilli resistant

to at least 10 mg. of PAS per cc. of media, in vitro. Four of these patients, however, had had prior courses of PAS in lower dosage. This increase in resistance of bacilli to PAS may interfere with the later use of combined streptomycin and PAS. Therefore, it would seem that some special consideration or indication should exist to warrant the use of PAS alone.

Acknowledgment: The PAS levels were determined by Frank Schlenker, Ph.D., Chief Biochemist at Kennedy Hospital.

SUMMARY

1) High dosages of PAS are possible in most patients able to take smaller doses, but the side-effects are more common and more troublesome.

2) Increased doses of PAS generally lead to increased blood levels of the drug, but there is marked variation from patient to patient.

3) Large doses of PAS seem to bring about decreased blood levels of prothrombin.

4) The results obtained with the use of high doses of PAS, are not impressive as compared to the use of combined therapy.

5) Use of PAS alone gives rise to strains of bacilli resistant to PAS. This may interfere with the use of combined streptomycin and PAS therapy at a later date.

RESUMEN

1) Dar altas dosis de PAS es posible en la mayoría de los pacientes capaces de tomar dosis más pequeñas, pero los efectos secundarios son más comunes y más molestos.

2) Las dosis altas de PAS generalmente conducen al aumento del nivel sanguíneo de la droga, pero hay marcadas variaciones de un paciente a otro.

3) Las grandes dosis de PAS parecen provocar una disminución del nivel de protrombina en la sangre.

4) Los resultados obtenidos por el uso de altas dosis de PAS no son convincentes, comparando con los que se obtienen por el uso de la terapia combinada.

5) El uso de PAS solo dá origen a cepas de bacilos resistentes al mismo. Esto puede interferir con el empleo posterior de estreptomicina y PAS combinados.

RESUME

1) Les doses élevées de P.A.S. peuvent être utilisées chez la plupart des malades qui sont capables de prendre des doses de moins grande importance. Mais dans ces cas, les inconvénients sont plus fréquents et plus graves.

2) D'une façon générale, l'augmentation des doses de P.A.S. a comme conséquence l'augmentation du taux sanguin de ce produit mais il existe des variations très nettes selon le malade.

3) Les fortes doses de P.A.S. semblent amener une diminution de la prothrombinémie.

4) Les résultats obtenus par l'utilisation de fortes doses de P.A.S. ne sont pas remarquables si on les compare à ceux de l'association P.A.S.-streptomycine.

5) L'utilisation de P.A.S. seulement est à l'origine d'une résistance des bacilles au P.A.S. Celle-ci peut avoir des conséquences sur l'utilisation ventuelle plus tard de l'association streptomycine-P.A.S.

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Whither Tuberculosis?

A Statistical Review of Reports from Selected American and European Communities

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PART I

MORBIDITY DECLINING AT LESSER RATE THAN MORTALITY

Tuberculosis mortality, it must be acknowledged, is declining at the present time at an accelerated rate. A review of reports from a selected number of countries and large areas reveals particularly in 1950 unusually low tuberculosis death rates: In the United States, 22 per 100,000 population; in Canada, 26; in Sweden, 22; even in Iceland, 20. Preliminary reports for part of 1951 indicate a further striking decline; it may even be estimated, if one considers only the white population of the United States totaling some 135,000,000 people, that tuberculosis mortality among them is now at the rate of 16 only.

In Denmark, in 1950, the tuberculosis death rate was already as low as 14. Alongside rates in such a highly developed community, both in industry and agriculture, may well be quoted those of two distinctive American states predominately rural rather than industrial: Minnesota, where in 1950 the tuberculosis rate was 11, and Iowa, where the rate was down to 8. On the other hand, a rate of 24 prevailed in the State of New Jersey, an eastern area comprised mainly of industrial, urbanized communities bordering on extremely large population centers, such as Philadelphia and New York City.

Among countries under review here it should be noted that the tuberculosis death rate in 1950 in England and Wales, whose people are still reeling from the effects of World War II, was 36; in Italy, 40; in Scotland, 53; and in France, 57 (Table I).

Recent Changes

It is especially during the very last few years that tuberculosis mortality has been falling at an accelerated rate. If one compares the change in the death rates in the last five years, namely between 1945 and 1950, declines are found to range anywhere, in the areas surveyed, from 32 per cent to 78 per cent—except in Spain and

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TABLE I: TUBERCULOSIS DEATH RATES* IN EIGHTEEN AMERICAN AND EUROPEAN COUNTRIES, AND THREE AMERICAN STATES BETWEEN 1930 AND 1950

County or State	*1930*	*'31*	*'32*	*'33*	*'34*	*'35*	*'36*	*'37*	*'38*	*'39*
United States	71	68	63	60	57	55	56	54	49	47
State of New Jersey	69	67	63	58	55	52	53	51	47	44
State of Minnesota	49	41	40	38	35	36	36	33	30	29
State of Iowa	33	30	30	26	25	26	24	22	19	19
Canada	79	74	68	65	60	61	62	60	55	53
England and Wales	87	87	82	80	74	70	67	68	62	62
Scotland	88	87	84	80	85	74	74	74	69	70
Northern Ireland	128	122	112	115	112	105	103	98	92	84
Eire	130	132	124	117	117	124	117	124	109	113
Iceland	216	189	199	154	145	129	135	132	91	79
Finland	240	222	211	201	191	181	210	200	199	197
Sweden	126	126	114	104	102	94	92	86	82	75
Norway	149	148	136	120	113	106	102	98	88	86
Denmark	71	69	69	58	55	52	47	44	41	34
Netherlands	75	73	64	60	55	52	50	48	45	41
France	156	152	140	131	126	123	118	119	117	121
Switzerland	125	122	116	106	101	97	95	87	82	80
Austria	139	140	130	120	111	109	100	100	101	—
Italy	112	108	104	99	92	89	87	86	80	76
Spain	123	129	117	117	111	107	102	120	129	122
Portugal	192	177	168	176	166	162	159	151	153	143

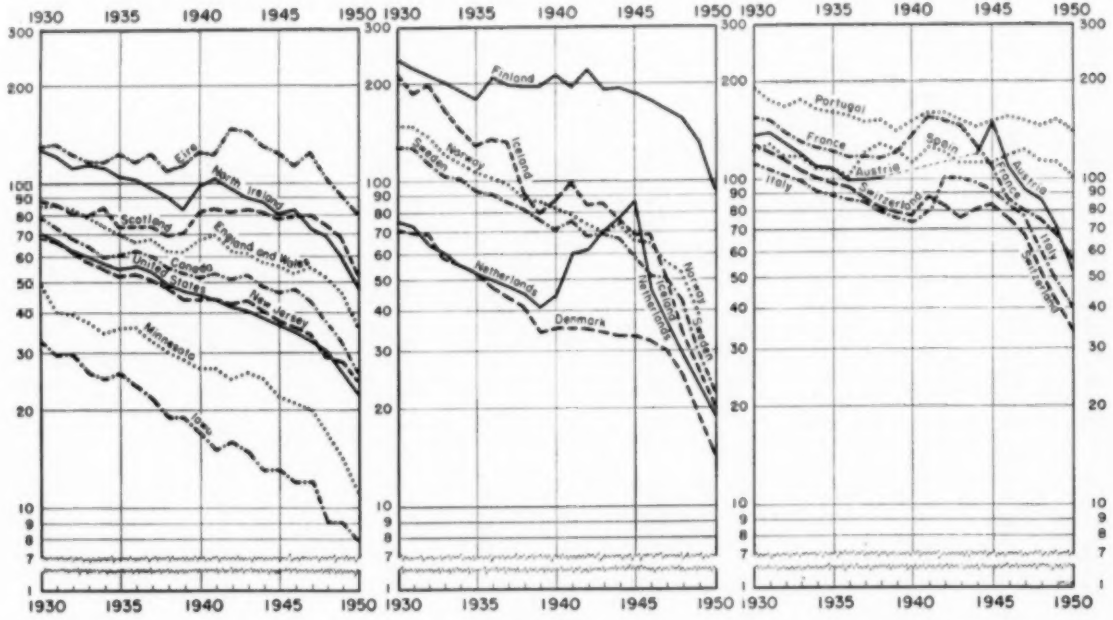
TABLE I (Continued)

County or State	*1940*	*'41*	*'42*	*'43*	*'44*	*'45*	*'46*	*'47*	*'48*	*'49*	*1950*
United States	46	44	42	41	39	37	35	33	30	26	22
State of New Jersey	44	44	43	44	41	38	36	34	29	27	24
State of Minnesota	27	27	25	26	25	22	21	20	17	14	11
State of Iowa	17	15	16	15	13	13	12	12	9	9	8
Canada	51	53	51	52	48	46	47	43	37	32	26
England and Wales	67	69	61	61	57	56	53	55	51	45	36
Scotland	81	84	82	83	82	78	79	80	75	68	53
Northern Ireland	98	104	97	91	89	80	83	73	69	59	48
Eire	125	124	147	146	130	125	114	125	104	91	80
Iceland	86	98	84	85	76	68	68	53	34	26	20
Finland	212	196	220	193	193	187	178	167	155	132	93
Sweden	71	75	68	69	67	59	51	51	42	28	22
Norway	82	80	73	69	74	65	64	56	52	38	29
Denmark	35	35	35	34	33	33	32	30	25	19	14
Netherlands	44	59	61	70	75	86	47	37	28	25	19
France	137	159	154	147	129	111	88	81	76	68	57
Switzerland	78	89	83	76	81	83	75	67	52	42	35
Austria	..	..	..	..	118	151	110	93	88	68	51
Italy	74	81	102	102	98	93	84	77	62	49	40
Spain	113	126	122	113	112	112	119	124	114	114	103
Portugal	153	160	160	152	145	152	157	153	148	151	142

*Per 100,000 population. Based on reports by courtesy U. S. National Office of Vital Statistics; Registrars-General, United Kingdom and Eire; World Health Organization and Central Statistical Bureaus of various countries. Compiled by G. J. Drolet, New York Tuberculosis and Health Association.

Tuberculosis Death Rate,* Since 1930

United States, states of New Jersey, Minnesota, and Iowa, Canada, England and Wales, Scotland, Northern Ireland, Eire, Iceland, Finland, Sweden, Norway, Denmark, Netherlands, France, Switzerland, Austria, Italy, Spain, Portugal



*Per 100,000 population.

FIGURE 1

Drolet and Lowell, N. Y. Tbc. and H. Assn.

Portugal where there has been little improvement. The lower percentage of decline, 32 per cent, was noted in Scotland where between 1946 and 1949 a new epidemic of tuberculosis struck the country. Whereas in 1930 the rate in Scotland was 88, as recently as 1944 it was still 82; however, between 1945 and 1950 it has finally come down from 78 to 53 (see Figure 1).

In the United States, during the five years under consideration, the tuberculosis death rate has fallen from 37 to 22 or by 41 per cent. In the three American states previously mentioned, these declines occurred between 1945 and 1950: In New Jersey, from 38 to 24, or by 37 per cent; in Iowa, from 13 to 8 only, or by 38 per cent; and, in Minnesota, from 22 to 11, or by no less than 50 per cent.

In Canada, the decline in the tuberculosis death rate, between 1945 and 1950, amounted to 43 per cent. In England and Wales, the rate was reduced from 56 to 36, or by 36 per cent; in Eire, from 125 to 80, or by 36 per cent. In Northern Ireland, between 1945 and 1950, the rate dropped by 40 per cent.

The decline of tuberculosis mortality in France, during the past five years, has been notable, the death rate falling from 111 to 57, or by 49 per cent. In Italy, during the same period the rate fell by 57 per cent, namely, from 93 to 40.

Scandinavian Countries

Of particular interest are the present tuberculosis death rates in the Scandinavian countries. In 1950, the following rates were prevailing: In Finland, 93; in Norway, 29; in Sweden, 22; in Iceland, 20; in Denmark, 14; and, in the Federal German Republic (Western Germany) the rate was 39.

During the five years from 1945 to 1950, in Norway the death rate came down from 65 to 29, or by 55 per cent; in Sweden, it fell from 59 to 22, or by as much as 63 per cent; and, in Denmark, from 33 to 14, or by 58 per cent. Against the rate of progress in these last three countries, where BCG vaccination has been practised on an increasing scale, must be placed the remarkable decline in the tuberculosis death rate in Iceland, whose people are of the same racial stock, and where the vaccine has hardly been utilized. In 1945, the mortality rate there was still 68 per 100,000 population; in 1950, it was 20 only, a reduction of 71 per cent—the greatest to be noted in the series of the Scandinavian countries under review.

Attention should be drawn to the great gains against tuberculosis mortality also made in the Netherlands. As against a rate of 86 in 1945—reflecting the sufferings of World War II—in 1950

it was down to 19, a drop of 78 per cent, the greatest of any in this entire series of observations.

Another striking, if isolated, instance of a remarkable reduction of tuberculosis mortality is that reported by de Abreu[1] of Rio de Janeiro, where in 1945 the tuberculosis death rate in that large South American city was still 342 per 100,000 population; in 1950 the provisional rate was figured at 168. A further interesting aspect in this Brazilian center was the fact that the reduction occurred mostly in the adult group of the population and that the decline among children was least of any. As a matter of fact, the death rate among infants under one year actually rose between 1945 and 1949 from 104 per 100,000 to 144. Among children one to two years old the rate increased from 168 to 278. And yet during the same years the proportion of newborn children vaccinated with BCG had increased from 44 per cent to 67 per cent. The entire group of children under ten averaged a decline of only 5 per cent in its tuberculosis death rate, while the adult group 20 to 50 years of age enjoyed reductions ranging between 23 to 37 per cent.

The increase of mortality among young children in Rio de Janeiro occurred while at the same time mass chest x-ray examinations were being multiplied sevenfold: 70,000 approximately in 1945 and 500,000 in 1950. Between 1945 and 1948 alone these surveys in the apparently well population led to the discovery of 3,450 new cases of tuberculosis. This naturally resulted in increased opportunities for isolation and earlier treatment of these newly discovered foci of possible infection. And yet, while elsewhere anti-tuberculosis campaigns benefit children most, here the contrary situation developed in a group where BCG vaccination was stepped up sharply. It is therefore important to weigh the recent observations of Myers[2] that "this report of increased mortality among young children of Rio immediately following those of Vorwald et al.[3] and Dubos[4] to the effect that silicotic guinea pigs and mice on deficient diets develop progressive and killing tuberculosis from BCG . . . should cause every one to demand that many facts which we do not now possess be established concerning this organism."

In the notable 1951 Biggs Memorial Lecture, Dubos[5] of the Rockefeller Institute while reviewing "the biological and social aspects of tuberculosis" recalled the variety of factors acknowledged to influence the course of the infection still almost universal among adults: the physiological state of the individual, his nutritional condition, his inborn resistance or familial susceptibility, his emotional state, the influence of socio-economic surroundings, working and living conditions.

If these factors can result in the development of progressive disease in individuals "naturally vaccinated" with the human type of tubercle bacilli, may it not be asked how long can it be maintained that BCG will remain harmless *under all circumstances?*

Changes, Past Twenty Years

If one reviews the tuberculosis mortality over a longer period, for instance during the 20 years between 1930 and 1950, in the communities whose reports are at hand it will be seen that the decline in their rates has ranged anywhere from only 16 per cent in Spain, to 91 per cent in Iceland. In the United States, the tuberculosis death rate fell from 71 in 1930 to 22 in 1950, or by 69 per cent; in Canada, by 67 per cent; in England and Wales, by 59 per cent; in France, by 63 per cent. Switzerland, spared the horror of World War II saw its rate cut by almost three-quarters, namely by 72 per cent.

In the Scandinavian countries, the reduction in their tuberculosis death rate during the last 20 years was as follows: In Denmark, 80 per cent; in Norway, 81 per cent; and in Sweden, 83 per cent. On the other hand, in the same group of these northern European countries must be noted, as previously referred to, the extreme gains made in Iceland where the rate during the past 20 years has been brought down from 216 in 1930 to 20 in 1950—an outstanding reduction of 91 per cent.

Actual Prevalence of Tuberculosis

In countries where there have been active campaigns against tuberculosis there is, on the whole, undoubtedly a lesser prevalence of the disease. Tuberculin-testing surveys, especially in the United States, reveal a lower proportion of infected children, though not necessarily so among adults. It would be a serious mistake, however, to conclude because of the fast declining mortality that the disease is now prevailing on similar low levels. Unfortunately there are only limited data available with regard to the registration of tuberculosis cases in various countries from which to ascertain the incidence of the disease, but even these certainly give no basis for assuming that there is not a very great deal of tuberculosis as yet to be brought under control. On that score, it is therefore important to study the registration of tuberculosis cases in five particular areas for which reports are at hand: the United States, Canada, England and Wales, Scotland, and Denmark (see Figures 2 and 3).

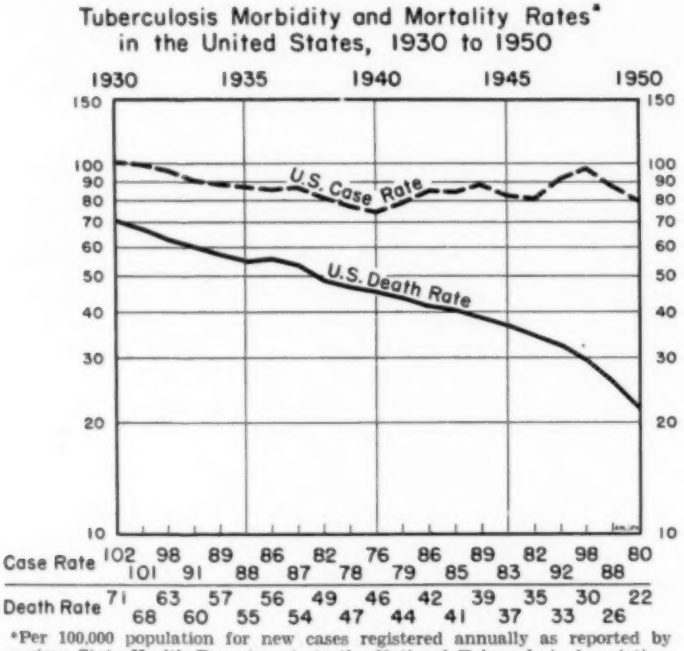
According to annual investigations in the United States made by the National Tuberculosis Association, the various state health authorities reported that in 1930 there had been registered with

them a total of 124,940 new cases of tuberculosis and in 1950 almost as many, namely, 121,228. The cases registered in the United States reached a low point in 1940 when they totaled 100,772; but between 1940 and 1950 the number reported rose materially, namely to 136,778 in 1948. The outbreak, therefore, of new cases of tuberculosis followed nowhere the mortality trend; in 1940 the deaths numbered 60,428, and in 1950 approximately 33,500 (Table II).

In Canada, the figures of tuberculosis registration in the early years beginning in 1930 are obviously incomplete; however, taking the decade 1940-1950 we see the new cases of tuberculosis reported to the various provincial authorities numbering 10,226 in 1940; in 1950 they had risen to 12,429, an increase of 22 per cent (Table III).

In England and Wales, according to the reports of the Ministry of Health, in 1940 the total notifications numbered 49,967; ten years later they had risen to 52,062, an actual increase of 2,095 or of 4 per cent (Table IV). In Scotland where for several years,

FIGURE 2



*Per 100,000 population for new cases registered annually as reported by various State Health Departments to the National Tuberculosis Association, and for deaths according to National Office of Vital Statistics.

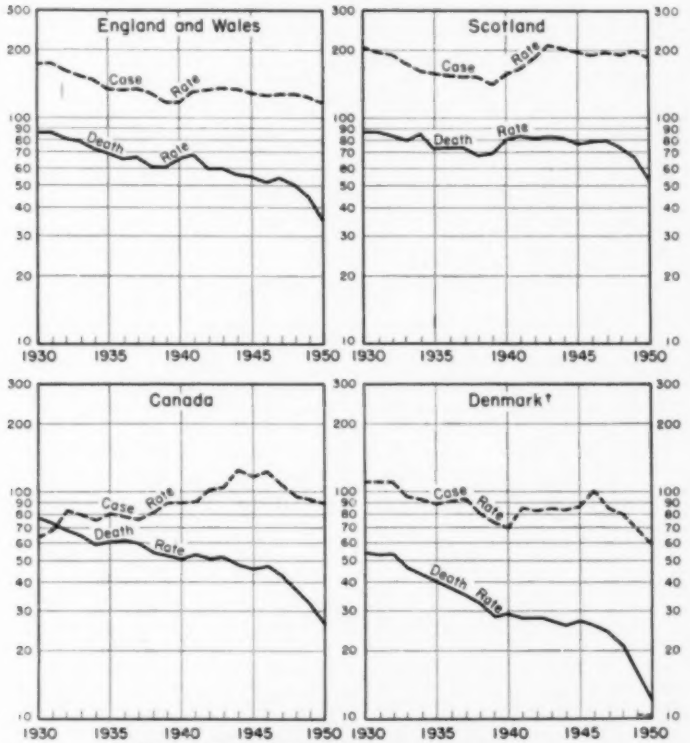
as already stated, tuberculosis has been rife the total notifications of new cases in 1940 numbered 7,722 whereas in 1950 they had risen to 9,682. As a matter of fact, more than 10,000 new cases were notified annually in 1947, 1948 and 1949. Between 1940 and 1950, among the Scottish people, there was an increase in the number of reported cases of tuberculosis of no less than 25 per cent.

In Denmark, figures are available with regard to the registration of new cases of pulmonary tuberculosis (Table III). They are particularly interesting when studied alongside the entirely different trend there too taken by the mortality.

The greatest contribution against tuberculosis likely to be made with BCG vaccination should be towards prevention of disease.

FIGURE 3

Tuberculosis Morbidity and Mortality Rates*, 1930 to 1950



*Per 100,000 population.
†New cases and deaths from pulmonary tuberculosis only.

TABLE III: CANADA, DENMARK: TUBERCULOSIS NEW CASES, DEATHS and Ratio of Mortality to Registration, 1930 to 1950

Year	CANADA† New Cases	CANADA† Tuberc.* Deaths	CANADA† Ratio Deaths to Cases Per Cent	CANADA† Case Rate‡	CANADA† Death Rate‡	DENMARK PULMONARY Cases	DENMARK PULMONARY Deaths	DENMARK Ratio Deaths to Cases Per Cent	DENMARK Case Rate‡	DENMARK Death Rate‡
1930	6,562	8,075	123	64	79	3,889	1,899	49	110	54
1931	7,193	7,616	106	69	74	3,926	1,894	48	110	53
1932	8,835	7,166	81	84	68	3,934	1,888	48	110	53
1933	8,451	6,939	82	80	65	3,455	1,670	48	95	46
1934	8,187	6,431	79	76	59	3,350	1,560	47	92	43
1935	8,767	6,597	75	81	61	3,272	1,467	45	89	40
1936	8,638	6,763	78	79	62	3,370	1,359	40	91	37
1937	8,472	6,669	79	77	60	3,500	1,319	38	93	35
1938	9,090	6,126	67	82	55	3,040	1,217	40	80	32
1939	10,182	5,977	59	90	53	2,806	1,068	38	74	28
1940	10,226	5,789	57	90	51	2,687	1,121	42	70	29
1941	10,473	6,072	58	91	53	3,286	1,084	33	85	28
1942	12,015	5,980	50	103	51	3,248	1,091	34	83	28
1943	12,361	6,168	50	105	52	3,348	1,053	31	85	27
1944	15,060	5,724	38	126	48	3,343	1,056	32	84	26
1945	14,328	5,546	39	118	46	3,460	1,101	32	86	27
1946	15,263	5,821	38	124	47	4,122	1,086	26	101	26
1947	13,739	5,449	40	109	43	3,522	1,010	29	85	24
1948	12,363	4,773	39	96	37	3,351	895	27	80	21
1949	12,777	4,295	34	94	32	2,906	672	23	69	16
1950	12,429	3,549	29	90	26	2,507	507	20	59	12

*All forms of tuberculosis. †Exclusive Yukon and N. W. Territories. ‡Per 100,000 population. Population: Canada, 1950=13,821,000; Denmark, 1949=4,200,000. Based on reports by courtesy of Canadian Dominion Bureau of Statistics and Danish National Health Service.

Once an active case of tuberculosis has developed, it is rather the factor of treatment which will influence mortality. In Denmark, the home of BCG these days, very revealing are the figures relating to the outbreak of new cases of pulmonary tuberculosis and the mortality from that form of the disease. Between 1940 and 1950 the cases of pulmonary tuberculosis went from 2,687 to 2,507, a decline of only 180 cases, whereas the deaths dropped from 1,121 to 507 or by more than half in number.

In Norway, new cases of all forms of tuberculosis numbered 3,877 in 1940 and 3,505 in 1949, a decrease of 9 per cent; but, in the same period, the number of deaths fell from 2,415 to 1,242, a drop of 48 per cent.

TABLE II

UNITED STATES: TUBERCULOSIS NEW CASES, DEATHS and Ratio of Mortality to Registration, 1930 to 1950

Year	New Cases	Tuberc.* Deaths	Ratio Deaths to Cases Per Cent	Case Rate§	Death Rate§	Patients† Admitted to Hospitals
1930	124,940	88,010	70	102	71	80,846
1931	124,858	84,521	68	101	68	80,562
1932	121,961	78,484	64	98	63	93,112
1933	114,412	74,842	65	91	60	84,327
1934	113,020	71,609	63	89	57	82,455
1935	111,856	70,080	63	88	55	86,113
1936	110,218	71,527	65	86	56	99,234
1937	112,394	69,324	62	87	54	101,839
1938	107,021	63,735	60	82	49	100,801
1939	101,470	61,606	61	78	47	90,615
1940	100,772	60,428	60	76	46	90,936
1941	105,714	59,251	56	79	44	101,473
1942	117,157	57,690	49	86	42	101,526
1943	118,042	57,005	48	85	41	91,674
1944	124,789	54,731	44	89	39	88,281
1945	117,400	52,916	45	83	37	86,186
1946	118,014	50,911	43	82	35	99,741
1947	135,624	48,064	35	94	33	99,080
1948	136,778	43,833	32	93	30	105,588
1949	134,455	39,100	29	90	26	113,078
1950	121,228	33,557▲	28	80	22	113,275

*All forms of tuberculosis. ▲Provisional. §Per 100,000 population. †As reported by Council on Medical Education and Hospitals, American Medical Association. Rates based on "de jure" population. Population: April 1, 1950=151,132,000, including armed forces overseas. Based on reports by courtesy of National Tuberculosis Association and National Office of Vital Statistics.

TABLE IV: ENGLAND AND WALES, SCOTLAND: TUBERCULOSIS NOTIFICATIONS, DEATHS and Ratio of Mortality to New Cases, 1930 to 1950.

	ENGLAND AND WALES					SCOTLAND				
Year	New Cases	Tuberc.* Deaths	Ratio Deaths to Cases Per Cent	CaseRate§	Death Rate§	New† Cases	Tuberc.* Deaths	Ratio Deaths to Cases Per Cent	Case Rate§	Death Rate§
1930	70,110	34,816	50	176	87	9,913	4,286	43	203	88
1931	70,246	34,959	50	176	87	9,600	4,205	44	198	87
1932	66,496	32,810	49	165	82	9,446	4,123	44	193	84
1933	62,914	32,435	52	156	80	8,610	3,910	45	175	80
1934	60,596	30,124	50	150	74	8,051	3,704	46	163	85
1935	55,642	28,489	51	137	70	7,890	3,647	46	159	74
1936	55,276	27,467	50	135	67	7,755	3,665	47	156	74
1937	55,821	27,754	50	136	68	7,584	3,663	48	152	74
1938	53,779	25,539	47	130	62	7,565	3,432	45	152	69
1939	49,107	25,623	52	118	62	7,097	3,526	50	141	70
1940	49,967	28,144	56	119	67	7,722	3,979	52	157	81
1941	55,347	28,670	52	133	69	8,294	4,175	50	167	84
1942	56,590	25,549	45	135	61	9,048	3,998	44	186	82
1943	58,122	25,649	44	138	61	10,088	3,959	39	211	83
1944	57,781	24,163	42	136	57	9,933	3,936	40	207	82
1945	55,713	23,955	43	131	56	9,658	3,803	39	198	78
1946	54,869	22,847	42	128	53	9,713	3,984	41	193	79
1947	55,407	23,550	43	129	55	10,117	4,095	40	197	80
1948	56,127	21,983	39	129	51	10,046	3,901	39	194	75
1949	55,323	19,832	36	126	45	10,300	3,484	34	199	68
1950	52,062	15,970	31	119	36	9,682	2,779	29	187	53

*All forms of tuberculosis. †Includes formal "notifications" of new cases and deaths of persons who had escaped notification. §Per 100,000 population. *Deaths include those of non-civilians. Rates since 1939 based on population including Armed Forces and Merchant Marines at home and abroad. Population, 1951: England and Wales=43,744,924; Scotland=5,095,969. Based on reports by courtesy of Ministry of Health, England and Wales; and Department of Health, Scotland.

It is also appropriate to record here that in 1948, according to Lindhardt[6] of the Danish National Health Service, 4,408 beds were available in all types of tuberculosis institutions, or a ratio of five beds against each annual death in 1948—and of nearly nine in 1950. Similarly in Norway, if one considers all tuberculosis institutional provisions in cottage hospitals, homes, and sanatoria—totalling 5,277 beds recently according to Gedde-Dahl of the Norwegian National Tuberculosis and Public Health Association—we see there too the high ratio of more than four beds per annual death. Evidently, both in Denmark and Norway, institutional, medical treatment must be acknowledged to be the decisive factor in the reduction of the mortality rather than the efforts directed, as with BCG, against the outbreak of new cases.

Influence of Mass Surveys on Registration of Cases

Before commenting further on the probable reason for the differences between morbidity and mortality trends we must answer the possible criticism that the rise in registration of new cases is due to the increased number of mass chest x-ray surveys for the detection of tuberculosis. But, close study of the findings in mass surveys will show that the contribution they make to the registration of cases is fairly limited. For instance, during 1949 and 1950, in New York City the Department of Health reports having examined in group surveys a total of 551,793 individuals and that among them, after thorough clinical checkup of "suspects," there were 942 cases of active tuberculosis. Of these cases, 916 were of the pulmonary type. We are not told, however, as to whether all of them were previously unknown to the Department of Health. In any event, these 916 cases of active pulmonary tuberculosis are to be placed first against the total new cases of tuberculosis registered in New York City during these two years; the latter amounted to 16,284. The tuberculosis associations in New York as elsewhere also conduct mass surveys, but in the majority of the campaigns here it is done in cooperation with the Department of Health; the voluntary agencies inaugurate the project with a public education drive. Frequently the Department supplies the "films."

The Department of Health's records of case-finding in New York cover at least 60 per cent of all the work of this character. The total number of new cases found in mass surveys may therefore have been for the two years mentioned less than 1,500, or approximately between 8 and 9 per cent of all the new cases registered in this city. In fact, for a previous year the Deputy Commissioner of Health stated that little more than 3 per cent of the cases found in surveys were previously unknown. But there is another impor-

tant aspect to bear in mind as to the influence of mass surveys in raising the total registration of tuberculosis. Among the 916 active cases of pulmonary tuberculosis already noted in the Department of Health group in 1949 and 1950, more than two-thirds, namely 68 per cent, were either in the moderately advanced or far advanced stage of the disease. Agreeing that their condition was disclosed at an earlier date than might have been done ultimately, it is most likely that the cases found with advanced tuberculosis already were bound to come to the attention of medical or institutional authorities sooner or later and, therefore, to get into the register. In other words, even where cases are found in mass surveys it does not mean necessarily that they would not eventually be included in the register of new cases. The trend of the tuberculosis roster of active cases undoubtedly parallels the current prevalence of serious tuberculosis in the community regardless whether reports originate from surveys, private physicians, clinic or hospital authorities.

Again on this point of the limited contribution made by mass chest x-ray surveys to final registration of cases, the 1947 report of the Canadian Tuberculosis Association sheds precise light. Reporting on a total of no less than 1,292,306 individuals x-rayed that year in various parts of Canada, there were found among them 1,968 cases of active tuberculosis; however, no less than 793 were previously known and therefore already reported. And in Canada, as in New York City, the majority of the new cases of tuberculosis were in an advanced stage of the disease; they were, therefore, sooner or later apt in most instances to come to the attention of reporting authorities. One must not conclude from these observations that mass chest x-ray surveys are not valuable; they are especially so in that they uncover their cases earlier than would naturally happen; but they do not add materially to the final registration of cases with frank disease.

Trend of Hospitalization

With regard to morbidity from tuberculosis and its trend, there are unique figures for the United States to be had from the reports of the Council on Medical Education and Hospitals of the American Medical Association. Annually, this responsible authority conducts a survey of the number of patients in various types of hospitals throughout the country. During 1930 a total of 80,846 tuberculosis patients were admitted to the then 511 tuberculosis institutions, reported the Council (Table II). In 1940, again the Council stated it had found that a total of 90,936 patients had been admitted to tuberculosis hospitals in the United States. Finally, in 1950, the patients admitted this time to 431 sanatoria or tuberculosis hos-

pital services numbered no less than 113,275, the largest ever reported during the past 20 years.

When one recalls the careful selection made in sending cases of tuberculosis to hospitals and the additional diagnostic tests applied to them in the institutions, the reports of the American Medical Association undoubtedly reflect an accurate picture of the large number of tuberculosis cases still requiring attention. Certainly here their number is not decreasing, as might be suggested from the mere mortality reports in the community. Between 1940 and 1950 there was an actual increase of 22,339 in the number of tuberculosis patients admitted to hospitals in the United States, or of 25 per cent.

What is really happening, particularly in recent years, is that the results of the treatment of tuberculosis with its newer adjuvants through chemotherapy and skillful surgery are increasingly and strikingly more favorable. It is mortality which is declining rather than morbidity. In New York City, the reports to the Tuberculosis Sanatorium Conference of Metropolitan New York[7] offer a precise measure of the favorable experience during the five years from 1945 to 1950. In the first year mentioned in some 40 member institutions the total number of patients discharged, alive or dead, was 13,827. That year the number who died in these sanatoria and hospitals was 3,370; in other words, here was an institutional mortality rate of 24 per cent. In 1950, in these same institutions a still larger number of patients were taken care of, the discharge totaling 16,018; and yet, the deaths, 2,375, were almost 1,000 fewer than only five years previously. The institutional fatality rate had now dropped to 15 per cent. Similar declines of mortality have been reported in the tuberculosis services of the United States Veterans Administration. Barnwell,[8] in discussing "measurements of improved care," stated recently that "during the past four years the ratio of deaths per 1,000 occupied beds in our tuberculosis hospitals has decreased approximately one-third—from 227.3 to 153.7 in 1949." Similar reductions of tuberculosis mortality have been noted in Canadian hospitals and sanatoria.

A recent paper by Snell[9] on the "immediate results of sanatorium treatment" at the Colindale Hospital, Hendon, London, brings out clearly there too how improved medical and surgical care is primarily responsible for accelerating the decline of tuberculosis mortality. A survey of 2,472 cases at Colindale Hospital during the period 1938 to 1950 inclusive shows, for instance, these marked improvements in "sputum conversion results": In 1938, among patients discharged those who had had negative sputum for three consecutive months represented 17 per cent of the total; in 1940,

there were only 15.3 per cent; between 1942 and 1948 the results improved and the proportion of sputum conversions ranged between 26 and 29 per cent. Moreover in 1949 they rose to 56 per cent and, in 1950, to 63 per cent; almost two-thirds of the patients discharged last year were sputum-negative.

Snell remarks: "There seems little doubt that the well-marked and increasing improvement in sputum conversion rates observed in 1948-50 is due mainly to the introduction of streptomycin and P.A.S. This improved outlook is confirmed by the decrease in the number of deaths. Before 1948, some patients with a hopeless prognosis were as a policy transferred to hospitals nearer their homes so that the number of deaths recorded in these years is an underestimate of the true mortality. Since 1948 this practice has ceased, but the number of deaths has fallen progressively: In 1938, there were 30 deaths; in 1940, 29; in 1946, 48; in 1948, 30; but in 1949, 20; and in 1950, 9 only."

"Community Case Fatality"

Another measure of the influence of treatment in modifying mortality rates is readily to be had by studying the relationship between the rate for new cases and the death rate in the communities for which reports are at hand with regard to registration of both cases and deaths.

In the United States, in 1930, when there were 124,940 new cases of tuberculosis registered, the deaths from tuberculosis numbered 88,010, indicating what might well be called a "community case fatality" of 70 per cent (Table II). This ratio of deaths to cases declined very slowly for a number of years. In 1940, it was still 60 per cent. On the other hand, between 1945 and 1950 it rapidly fell annually as follows: 45 per cent in 1945; thereafter, 43 per cent, 36 per cent, 30 per cent for two years and finally 28 per cent only in 1950.

In Canada, in 1940, with 10,226 new cases and 5,789 deaths, the ratio of deaths to cases was 57 per cent (Table III); in 1950, it came down to 29 per cent, almost the same as in the United States where it was 28 per cent. In England and Wales, the ratio of deaths to cases has fallen from 56 per cent in 1940 to 31 per cent in 1950 (Table IV). Even in Scotland, despite an upsurge of tuberculosis recently, the ratio, which in 1940 was 52 per cent, was also down to 29 per cent in 1950. In Denmark, among victims of pulmonary tuberculosis, as mentioned previously, there are striking differences between the trend of morbidity and that of mortality (Table III). In 1940, the ratio between pulmonary deaths and cases was 42 per cent; in 1950, it reached the lowest mark, 20 per cent.

A few figures available for Norway from Gedde-Dahl, Secretary-General of the Norwegian National Tuberculosis and Public Health Association, with regard to patients treated in tuberculosis institutions show likewise that the cases followed there quite a different trend from that of the deaths. According to this authority, in the year 1939 the number of "treated patients" in tuberculosis institutions was 12,870; in 1945, 11,592; and, in 1947, 12,711. During the same years the mortality from tuberculosis in Norway was declining from 2,505 to 1,760, the corresponding death rates being 86 and 56, showing a reduction in mortality rates of 35 per cent and practically no reduction in the number of patients requiring institutional care. During the five-year period 1931-35 the number of patients admitted to tuberculosis institutions in Norway averaged annually 5,937; during the period 1941-45 they averaged 6,031; and yet between 1931 and 1945 the deaths from tuberculosis in Norway were falling from 4,165 to 1,980—in other words, by more than half. However, the admissions to tuberculosis institutions were almost identical in number right along.

As remarked by Edwards and Drolet[10] at the Forty-Fifth Annual Meeting of the National Tuberculosis Association at Detroit in 1949, "The death rate from tuberculosis is a limited and inadequate index of the prevalence of the disease in the community."

From the widely scattered and extensive reports just quoted, it is obvious, therefore, that it is primarily institutional care, or rather improved medical and surgical treatment of active cases of tuberculosis, which is now modifying so favorably the mortality record. Where tuberculosis campaigns remain weak, however, is still in the field of prevention with regard to reducing outbreaks of new cases of tuberculosis.

PART II

HOW MUCH CONTROL OF TUBERCULOSIS IN CHILDREN?*

Just as infant mortality, generally speaking, is a sensitive index of general health conditions, so in tuberculosis the incidence particularly of active cases among children is a prime index of the prevalence of tuberculosis in the community.

Experience has shown that the main factors in controlling tuberculosis in children, as well as in adults, are the following: First of all, adequacy of hospital facilities for the isolation particularly of open cases of tuberculosis; second, elimination of tuberculosis in cattle, especially in dairy herds, followed by pasteurization of milk; finally, inspection of meats and many other edible products. These

*An address before the Tuberculosis Sanatorium Conference of Metropolitan New York, Jersey City, May 9, 1951.

measures have a definite influence particularly among younger children still remaining most of their time at home. However, when they begin to go to school and widen their contacts among strangers some additional protection is needed in their new surroundings. One measure, the type for instance developed in the school system in New Jersey is of especial interest. In that state there is, first, the requirement of a periodic examination of all school employees —at the present time, this is done at least once in three years. Second, there has been supplemented, under a ruling of the State Board of Education, tuberculin testing and x-ray examination of materially large numbers of school children particularly those in high schools.†

In Europe, where importance has also been attached to hospitalization, there is in certain countries, particularly in Scandinavia, a growing practice of utilizing BCG vaccine with children as well as with other selected groups of adults.

Mortality Among Children

Detailed figures very kindly made available by Backer, the Chief of the Demographic Section of the Central Bureau of Statistics of Norway, and Lindhardt of the Danish National Health Service, permit interesting precise evaluation, at least from the angle of mortality, of the prevalence of tuberculosis in these two countries for ready comparison with similar information for the United States as a whole and especially for the State of New Jersey where, as just mentioned, additional steps have been taken, besides the general measures against tuberculosis prevailing there as elsewhere in this country, for the protection particularly of school children. The data for the three areas cover a full 20-year period from 1930 to 1949 inclusive.

At the beginning of that period, namely in 1930, it may be recalled that the tuberculosis death rate in Norway (149) for all ages was practically twice that prevailing in the United States (71) or in the State of New Jersey (69). In Denmark it was like ours (71). The same year among children under 15, while the death rate in New Jersey and in the United States was 18 per 100,000 children of that age group, the rate in Norway was almost three

†School Laws, session of 1939: Chapter 294, Public Laws 1939 . . . enacted by the Senate and General Assembly of the State of New Jersey: 1. The board of education of every school district shall periodically determine, or cause to be determined, the presence or absence of active or communicable tuberculosis in any or all pupils in public schools. . . . Chapter 295, Public Laws, 1939 . . . enacted by the Senate and General Assembly of the State of New Jersey: 1. Every board of education shall require a physical examination of all employees of the board at least once in three years . . . The scope of such examinations shall be determined under the rules of the State Board of Education.

times as high, namely, 52 (Table V). In Denmark it was twice as great (36). By 1949 the children's death rate in Norway had been brought down to 8 and that of Denmark to slightly under 4. However, in the United States as a whole, it was now 3.9 and therefore but half of that in Norway. In New Jersey, it was reduced even lower, namely, to 2.7 per 100,000 population under 15 years of age.*

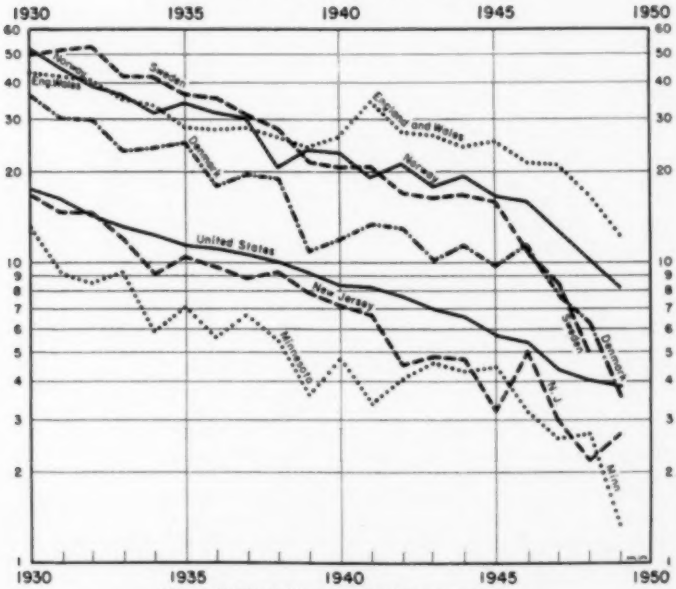
It should be added here that in Sweden in 1930 the tuberculosis death rate among children under 15 years of age was 49.8 per 100,000, only slightly less than that in Norway. In 1949, the rate in Sweden was down to 2.8 per 100,000 as compared with one of 3.9 in the United States, and 2.7 in New Jersey, but still twice that of Minnesota which was 1.3 only (see Figure 4).

*Note: Since presentation of the authors' address before the Metropolitan Sanatorium Conference in May 1951, additional reports have been received from the Minnesota Department of Health on the remarkably low death rates among children in that state. In 1949, only 9 deaths occurred among those under 15 years of age in a child population almost as large as that of Norway, the Minnesota rate that year being 1.3 per 100,000.

FIGURE 4

Tuberculosis Death Rate*, Children under Fifteen, Since 1930

United States, states of New Jersey, Minnesota, England and Wales, Norway, Sweden, Denmark



*Per 100,000 children under 15 years of age.

When one recalls the main characteristics of the places under discussion, it is all the more amazing—in a country highly industralized such as the United States or in areas of population concentration as exist in important sections of the State of New Jersey bordering on Philadelphia and New York City—to find the low tuberculosis death rates among children here as compared with those prevailing in comparatively sparse populations such as Norway and Sweden represent, but where perhaps an undue reliance is being placed upon BCG.

Death Rate Among School Children

It would seem from the data available that in New Jersey the effect of the special regulations for tuberculin testing, x-raying,

TABLE V

TUBERCULOSIS MORTALITY AMONG CHILDREN UNDER FIFTEEN
United States, States of New Jersey and Minnesota, England and Wales, Norway, Sweden and Denmark from 1930 to 1949.

PART 1: TUBERCULOSIS DEATHS

Year	United States	New Jersey	Minnesota	England and Wales	Norway	Sweden	Denmark
1930	6,425	193	98	4,167	414	759	357
1931	5,831	156	68	4,009	354	770	292
1932	5,072	152	63	3,836	303	727	289
1933	4,569	122	67	3,412	269	608	222
1934	4,276	91	42	3,156	238	591	224
1935	3,951	102	51	2,643	252	499	235
1936	3,789	92	40	2,514	221	474	167
1937	3,584	82	47	2,496	209	403	180
1938	3,371	84	38	2,350	139	365	176
1939	3,064	70	25	2,120	161	285	100
1940	2,787	63	33	2,297	153	268	109
1941	2,812	61	23	2,958	129	272	124
1942	2,702	43	28	2,327	140	227	121
1943	2,483	47	32	2,279	118	222	95
1944	2,388	48	30	2,121	130	233	110
1945	2,119	33	31	2,208	111	228	97
1946	2,047	52	22	1,912	111	162	116
1947	1,698	32	18	1,955	92	131	84
1948	1,636	24	19	1,562	74	79	68
1949	1,581	31	9	1,148	62	46	40

Child population under fifteen, 1949: United States=40,329,449; New Jersey=1,129,358; Minnesota=716,575; England and Wales=9,497,000; Norway=763,700; Sweden=1,650,000; Denmark=1,105,700.

examination of school personnel and of school children, has been to accelerate the decline of tuberculosis mortality to a greater extent than for the entire United States. In 1938, the year prior to the enactment of the law in New Jersey previously quoted, the tuberculosis death rate among children 5-14 years old in the United States was 6.6 per 100,000 and that of the children in New Jersey 5.6. A decade later, or rather in 1949, the tuberculosis death rate of children of that age in the United States had been reduced to 1.9 namely by 71 per cent.

In the State of New Jersey, whereas in 1938 there had been 36 deaths among children 5-14, in 1949 there were 9 deaths and the rate had declined during that period to 1.4 per 100,000 or by 75 per cent.

TABLE V: PART 2

DEATH RATE PER 100,000

Year	United States	New Jersey	Minnesota	England and Wales	Norway	Sweden	Denmark
1930	17.9	17.7	13.2	43.7	51.7	49.8	36.4
1931	16.3	14.6	9.2	42.1	44.6	51.3	30.1
1932	14.3	14.5	8.6	40.3	38.9	52.1	29.9
1933	13.0	11.9	9.2	35.8	35.3	41.9	23.1
1934	12.3	9.1	5.8	33.1	31.4	41.4	23.4
1935	11.4	10.4	7.1	28.5	34.0	36.1	24.8
1936	11.1	9.6	5.6	27.7	31.2	35.1	17.8
1937	10.6	8.8	6.7	27.9	30.2	30.3	19.4
1938	10.1	9.2	5.4	26.6	20.8	27.8	19.0
1939	9.2	7.9	3.6	24.3	24.2	21.8	10.8
1940	8.4	7.1	4.8	26.4	23.2	20.6	11.8
1941	8.3	6.7	3.4	34.6	19.4	20.9	13.4
1942	7.8	4.6	4.1	27.3	21.2	17.2	13.0
1943	7.0	4.9	4.7	26.6	17.9	16.4	10.0
1944	6.6	4.8	4.4	24.4	19.4	16.7	11.3
1945	5.7	3.2	4.5	25.2	16.3	15.7	9.7
1946	5.4	5.0	3.2	21.7	15.9	10.9	11.2
1947	4.4	3.0	2.6	21.4	12.8	8.5	7.9
1948	4.1	2.2	2.7	16.8	10.1	5.0	6.3
1949	3.9	2.7	1.3	12.1	8.1	2.8	3.6

Based on reports by courtesy of U. S. National Office of Vital Statistics; state departments of health, New Jersey and Minnesota; Registrar-General, England and Wales; Central Statistical bureaus of Norway, Sweden and Denmark. Compiled by G. J. Drolet, New York Tuberculosis and Health Association.

TABLE VI, PART 1: NORWAY, 1931-1949

Tuberculosis Mortality of Children by Age and Sex.

Years*	NUMBER OF DEATHS							DEATH RATE PER 100,000						
	'31-35	'36-40	'41-45	1946	1947	1948	1949	'31-35	'36-40	'41-45	1946	1947	1948	1949
Male:														
0- 4	64	42	32	33	24	17	26	56	38	26	23	16	11	16
5- 9	26	20	17	13	11	8	9	20	18	17	12	10	7	7
10-14	44	26	17	10	9	4	4	30	20	15	10	9	4	4
0-14	134	88	66	56	44	29	39	34	25	19	16	12	8	10
Female:														
0- 4	63	40	31	24	29	24	13	59	37	27	18	20	16	8
5- 9	29	21	13	13	9	12	5	23	20	13	12	8	11	4
10-14	57	33	16	18	10	9	5	41	27	15	18	10	9	5
0-14	149	94	60	55	48	45	23	40	28	18	16	14	12	6
Both Sexes:														
0- 4	127	82	63	57	53	41	39	55	38	26	20	18	13	12
5- 9	55	41	30	26	20	20	14	21	19	14	12	9	9	6
10-14	101	59	33	28	19	13	9	37	23	15	14	10	7	4
0-14	283	182	126	111	92	74	62	37	26	19	16	13	10	8

Norway child population, 1949: 0-4=316,400; 5-9=244,300; 10-14=203,000.
*Quinquennial figures are averages annually.

TABLE VI, PART 2: DENMARK, 1931-1949

Tuberculosis Mortality of Children by Age and Sex.

Years*	NUMBER OF DEATHS							DEATH RATE PER 100,000						
	'31-35	'36-40	'41-45	1946	1947	1948	1949	'31-35	'36-40	'41-45	1946	1947	1948	1949
Male:														
0- 4	81	49	36	44	28	24	10	53	31	20	21	13	11	4
5- 9	23	13	12	15	12	8	5	15	9	8	9	7	5	3
10-14	23	16	11	7	8	3	2	13	10	8	5	5	2	1
0-14	127	78	59	66	48	35	17	26	17	12	13	9	6	3
Female:														
0- 4	69	44	27	32	23	21	14	47	29	17	16	11	10	7
5- 9	29	10	10	8	5	5	4	18	7	7	5	3	3	2
10-14	27	14	13	10	8	7	5	16	9	9	5	5	5	3
0-14	125	68	50	50	36	33	23	26	15	11	10	7	6	4
Both Sexes:														
0- 4	150	93	63	76	51	45	24	50	30	18	18	12	10	6
5- 9	52	23	22	23	17	13	9	16	8	7	7	5	4	2
10-14	50	30	24	17	16	10	7	15	10	8	6	5	3	2
0-14	252	146	109	116	84	68	40	26	16	12	11	8	6	4

Denmark child population, 1949: 0-4=434,300; 5-9=362,900; 10-14=308,500.
*Quinquennial figures are averages annually.

TABLE VI, PART 3: UNITED STATES, 1931-1949

Tuberculosis Mortality of Children by Age and Sex.

	NUMBER OF DEATHS							DEATH RATE PER 100,000						
Years*	'31-35	'36-40	'41-45	1946	1947	1948	1949	'31-35	'36-40	'41-45	1946	1947	1948	1949
Male:														
0- 4	1,345	937	786	666	579	594	551	23.8	17.2	12.4	9.3	7.7	7.6	6.8
5- 9	481	299	198	181	107	106	132	7.9	5.4	3.4	2.9	1.7	1.6	2.0
10-14	494	364	241	174	148	103	87	8.2	6.1	4.1	3.0	2.6	1.8	1.5
0-14	2,320	1,600	1,225	1,021	834	803	770	13.1	9.4	6.8	5.3	4.2	4.0	3.8
Female:														
0- 4	1,175	865	725	634	520	544	559	21.4	16.4	11.9	9.1	7.2	7.2	7.2
5- 9	439	270	183	132	119	110	116	7.4	5.0	3.2	2.2	2.0	1.8	1.8
10-14	805	584	368	260	225	179	136	13.7	10.0	6.4	4.5	3.9	3.1	2.4
0-14	2,419	1,719	1,276	1,026	864	833	811	14.0	10.4	7.3	5.4	4.5	4.3	4.1
Both Sexes:														
0- 4	2,520	1,802	1,511	1,300	1,099	1,138	1,110	22.6	16.8	12.2	9.2	7.4	7.4	7.0
5- 9	920	569	381	313	226	216	248	7.7	5.2	3.3	2.5	1.8	1.7	1.9
10-14	1,299	948	609	434	373	282	223	10.9	8.0	5.3	3.8	3.3	2.4	2.0
0-14	4,739	3,319	2,501	2,047	1,698	1,636	1,581	13.5	9.9	6.9	5.4	4.4	4.1	3.9

United States child population, 1949: 0-4=15,890,309; 5-9=13,049,274; 10-14=11,389,866.
*Quinquennial figures are averages annually.

TABLE VI, PART 4: NEW JERSEY, 1931-1949

Tuberculosis Mortality of Children by Age and Sex.

	NUMBER OF DEATHS							DEATH RATE PER 100,000						
Years*	'31-35	'36-40	'41-45	1946	1947	1948	1949	'31-35	'36-40	'41-45	1946	1947	1948	1949
Male:														
0- 4	35	22	16	15	12	13	11	23.0	16.6	9.4	7.4	5.6	5.7	4.6
5- 9	12	7	2	3	1	2	2	6.5	4.7	1.3	1.8	0.6	1.1	1.1
10-14	14	8	5	3	2	0	5	7.7	4.4	3.0	1.9	1.3	0.0	3.3
0-14	61	37	23	21	15	15	18	11.9	8.1	4.7	4.0	2.8	2.7	3.2
Female:														
0- 4	32	21	12	18	8	4	11	21.2	15.9	7.4	9.3	3.9	1.9	4.9
5- 9	12	7	3	6	3	2	1	6.8	4.6	2.0	3.7	1.8	1.2	0.6
10-14	20	13	8	7	6	3	1	10.6	7.5	4.9	4.3	3.7	1.9	0.6
0-14	64	41	23	31	17	9	13	12.4	9.0	4.8	6.0	3.2	1.6	2.3
Both Sexes:														
0- 4	67	43	28	33	20	17	22	22.1	16.3	8.5	8.3	4.8	3.8	4.7
5- 9	24	14	5	9	4	4	3	6.7	4.6	1.6	2.7	1.2	1.2	0.8
10-14	34	21	13	10	8	3	6	9.2	6.0	4.0	3.1	2.5	1.0	1.9
0-14	125	78	46	52	32	24	31	12.2	8.6	4.8	5.0	3.0	2.2	2.7

New Jersey child population, 1949: 0-4=464,145; 5-9=354,054; 10-14=311,159.

*Quinquennial figures are averages annually. Note: 1949 figures from National Office of Vital Statistics, all other from New Jersey State Department of Health.

Death Rate Among Young and Older Children

The detailed reports from Norway and Denmark permit close comparisons of particular groups of children during the past 20 years. During the five-year period 1931-35, in Norway the average annual tuberculosis death rate of children of both sexes under five years of age was 55 per 100,000 population; by 1949, this had been reduced to 12 (Table VI, part 1). In Denmark whereas formerly the rate for these young children was 50, lately it was 6 (Table VI, part 2). During those years, the tuberculosis death rate of children under five in the United States had fallen from 23 per 100,000 to 7.0 in 1949 (Table VI, part 3).* In New Jersey, where the rate was practically the same as that of the country as a whole during the five-year period 1931-35, namely 22, by 1949 it was reduced to 4.7, the lowest of any in the group under consideration.

In these countries and State the group of children between the ages of five and nine had, as usual, the lowest tuberculosis death rates. In Norway between the earlier period of 1931-35 and the year 1949 their death rate had come down from 21 to 6; in Denmark, from 16 to 2; in the United States, from 7.7 to 1.9; and, in New Jersey, from 6.7 to 0.8.

Children in the age group 10-14 years of age had slightly higher tuberculosis rates than the preceding five-year group. In Norway, it was originally 37 and during the last year mentioned 4; in Denmark, 15 and now 2. In the United States, among these older children, it was 10.9 and has been reduced to 2.0. In New Jersey, it was lower in both instances; first of all during the five-year period 1931-35 when it was 9.2 and in 1949 when it had dropped to 1.9.

The differences in the mortality record among children in these four places may be more exactly crystalized as of the present time if we concentrate on the year 1949 and take the prevailing rates in Norway at 100 as an index (Table VII). In Norway among children under five, if we take their death rate of 12.3 at 100, we then see that the same group of very young children in Denmark was 5.3 or 43 per cent of Norway's, that those in the United States with a rate of 7.0 was 57 per cent of that of Norway, while the rate of New Jersey children of 4.7 was slightly over a third, or 38 per cent of that suffered by the children of the first mentioned place.

Similarly among children five to nine, taking the Norway rate

*It must be remembered all the time that the present population of the United States includes some 15,000,000 Negroes, not to mention in the Southwest large numbers of Mexicans and Indians—all of them with higher death rates than the remainder of the population.

at 100, that of the children in the United States was 33 per cent or one-third of it. New Jersey's rate was 14 per cent or one-seventh only to Norway's while Denmark's was still 42 per cent.

Finally, taking the entire group of children under 15 years of age, their tuberculosis death rate in the United States in 1949 was 48 per cent, or only half that of all the children in Norway, and that of New Jersey children only 33 or one-third that of Norwegian children. In Denmark, its rate of 3.6 per 100,000 may be compared with the rate of 8.1 in Norway and of 2.7 in New Jersey.

Twenty-year Changes

The greater benefits accruing to children from the conditions and measures against tuberculosis in the United States may be gauged from the following broader review of the mortality records here and abroad during the 20-year period 1930-1949.

In 1930, in Norway deaths from tuberculosis at all ages numbered 4,197 and those of children under fifteen 414, the latter being therefore 9.9 per cent of the total mortality. A similar proportion of nearly 10 per cent existed in Sweden. In Denmark at that time

TABLE VII

TUBERCULOSIS DEATH RATE AMONG CHILDREN

Norway, Denmark, the United States and New Jersey in 1949.

Sex and Age	NORWAY		DENMARK		United States		New Jersey	
	Rate*	Index†	Rate*	Index†	Rate*	Index†	Rate*	Index†
Male:								
0- 4	16.0	100	4.4	28	6.8	43	4.6	29
5- 9	7.2	100	2.7	38	2.0	28	1.1	15
10-14	3.9	100	1.3	33	1.5	38	3.3	85
0-14	10.0	100	3.0	30	3.8	38	3.2	32
Female:								
0- 4	8.4	100	6.6	79	7.2	86	4.9	58
5- 9	4.2	100	2.2	52	1.8	43	0.6	14
10-14	5.0	100	3.3	66	2.4	49	0.6	12
0-14	6.2	100	4.3	69	4.1	66	2.3	37
Both Sexes:								
0- 4	12.3	100	5.3	43	7.0	57	4.7	38
5- 9	5.7	100	2.4	42	1.9	33	0.8	14
10-14	4.4	100	2.3	52	2.0	45	1.9	43
0-14	8.1	100	3.6	44	3.9	48	2.7	33

*Per 100,000 children in each age group. †Index being that of Norway taken at 100 in each age and sex group.

children suffered from tuberculosis, relatively, even more; during 1930 their deaths, 357 in the grand total of 2,502, made up 14.3 per cent of the mortality. In the United States, 20 years ago, the deaths of the children, 6,425, represented 7.3 per cent of the total mortality—88,010. In New Jersey the 193 deaths of the children under 15 in the 2,805 at all ages were 6.9 per cent of the total.

By 1949 in Norway the children under 15 contributed 62 deaths in the total of 1,242 or 5.0 per cent of the mortality of that year. In Sweden it was 2.3 per cent and in Denmark 5.1 per cent. In the United States the deaths of the children, 1,581 in the total 39,100 in 1949, represented 4.0 per cent of the entire mortality. And in New Jersey, even though with a marked increase of population recently tuberculosis deaths at all ages exceeded slightly those of Norway, 1,298 as compared with 1,242, those of the children were only half of Norway's, namely 31 as against 62, and their proportion to the total mortality was 2.4 per cent only.

In England and Wales, high tuberculosis death rates among children have been prevailing for several years. World War II exposed them particularly to new dangers. In 1949 the rate there was still 12.1, three times that of the United States.

New York City Children

Incidentally, it is of interest to see what was the death rate in New York City in 1949 among children under 15 in comparison with the rate of 8.1 in Norway.* Here in this highly congested center of almost 8,000,000 people including a Negro population of 750,000, the tuberculosis death rate among children the same year was only 3 per 100,000. In a child population of over a million and a half, the deaths that year from tuberculosis numbered only 52; furthermore, of these, 26, or half, occurred in the comparatively susceptible group of the colored—not to mention white Puerto Rican children.

Hospital Facilities

Reference has already been made to the importance of hospital facilities in the control of tuberculosis. It is therefore important to set down here a few reports as to their extent in some of the countries or areas under discussion.

According to recent correspondence in the Journal of the American Medical Association (January 27, 1951): Norway, "With a population of only a little more than 3,000,000 is now endowed with more than 100 tuberculosis cottage hospitals or homes with more than 3,000 beds, and a score of sanatoriums and coast hos-

*Norway with a child population of 763,700, half that of New York, had 62 deaths in that group in 1949.

pitals with some 2,000 beds." Hence, if one correlates the beds in sanatoria and hospitals only to the 1,242 deaths in the year 1949 we have here a ratio of 1.6 beds per annual death.

In the United States, according to the National Tuberculosis Association, there were in 1950 a grand total of 125,398 beds available in sanatoria and hospitals, a ratio of well over 3.7 beds per annual death that year. The same authority reports for the State of New Jersey a total of 4,288 beds in tuberculosis institutions and, since in 1950 the deaths in that state numbered 1,170, there is a ratio of nearly 3.7 beds available per annual death or more than twice the proportion available in Norway when one considers only formal hospitals and sanatoria. The practice in the latter country to include cottages and homes is hardly consistent with that in America where we do not count private cottages and homes in various health resorts, without permanent resident medical staff, though they are still quite numerous here.

Minnesota, with only 331 deaths in 1950, had 2,886 beds available in tuberculosis hospitals and sanatoria, a ratio therefore of 8.7 beds per annual death. However it should be noted that the same year new cases of tuberculosis still numbered 2,038.

In Denmark, Lindhardt reported, in 1948, 3,095 beds available besides 1,038 in 15 seaside hospitals and sanatoria. Against some 650 deaths in 1950, the first figure alone relating to beds would indicate a ratio of nearly 4.8 beds per annual death.

BCG Vaccination

Passing reference having been made in this review to BCG vaccination, it is therefore pertinent to mention a few figures relative to the frequency of its use. First, in the United States it must be said that the use of BCG has been rather limited until recently.

In New York City, in 1926, a study was undertaken by the Department of Health, under the direction of Park.[11] Over a period of a few years 1,011 children were vaccinated; they were all from tuberculous families. In Chicago, Rosenthal[12] and his associates utilized BCG among small groups of newborn infants, also with nurses, medical students and some selected individuals. Aronson and Palmer,[13] a few years ago, vaccinated 1,565 members of North American Indian tribes in the West. In 1946, the United States Public Health Service,[14] in the development of a comprehensive study of tuberculosis in Muscogee County of Georgia, included at first in the program the vaccination of a small number of children of school age. Later, however, it was intended to be offered to all of the tuberculin-negative population in that area which includes the city of Columbus.

In New York State, Plunkett[15] reports that for the three-year

period 1948-1950 the Division of Tuberculosis Control has a record of 15,631 persons having been vaccinated, a third of them either hospital personnel, student nurses or medical students.

The Bureau of Indian Affairs of the United States Department of the Interior has also reported that to the end of 1950 a total of 12,804 children had been vaccinated and that it was planning by the end of next year to complete the vaccination of all the children enrolled in Indian schools. The program in this group is being developed by the United States Public Health Service and the Henry Phipps Institute of Philadelphia.

These reports would indicate that so far probably less than 75,000 children or adults had been vaccinated with BCG in the United States, a figure to be remembered against, for instance, a child population exceeding 40,000,000.

In Canada, according to the Canadian Tuberculosis Association,[16] "BCG vaccination continues to expand and is now in use in all provinces." In the Province of Quebec, where the population is mostly French Canadian, at least 20 per cent of the newborn babies are vaccinated. In the other provinces it is used to protect nurses, medical students and contacts of open cases. Between 1926 and the end of March 1950, the Association reports a grand total of 314,515 BCG vaccinations in Canada, of which 290,198 were performed in the Province of Quebec as against, for instance, only 4,544 vaccinations in Ontario which has a slightly larger population.

It may then not be amiss to add that in 1949 the tuberculosis death rate in Quebec, 49, was three times that in Ontario, 16.

In England, it is only recently that the Ministry of Health has lifted the ban against the use of BCG. The first consignment of the vaccine from Copenhagen was received in October 1949.

In Iceland, where, as previously mentioned, the greatest decline in tuberculosis mortality has taken place during the past 20 years, there has been a most limited use of BCG. According to Sigurdsson,[17] it was first used in 1945 with only about 60 persons—medical students and nurses. Up to and including 1950, he adds around 6,000 individuals, mostly children between the ages of ten and thirteen, have received BCG.

In Finland, the first BCG vaccinations were carried out in 1941 when 1,800 persons were inoculated. Between 1941 and 1947 there were altogether about 170,000 persons vaccinated. In 1948 a veritable mass vaccination of 325,000 persons took place. From 1941 to the end of April 1949, vaccinations carried out in Finland had reached a total of 570,523 persons, reported Savonen[18] at the 1949 Conference on European BCG Programmes held in Copenhagen.

In Norway, BCG vaccination has been done sporadically since

1924. It lagged until 1939 when it was greatly activated during the German occupation of Norway in World War II. Official figures, according to Birkhaug,[19] represent only about 50 per cent of the returned reports. "The actual number of BCG vaccinations during the five years of occupation was probably close to 120,000." Since that time, Norway has enacted laws requiring tuberculin testing of the entire school population and making BCG vaccination obligatory for the tuberculin-negative population.

In Sweden, again according to Birkhaug, "In 1927 Walgren began a long-term investigation of BCG vaccination of infants born of tuberculous parents . . . BCG vaccination has been carried on in an ever increasing scale in Sweden in recent years." The number rose to 84,000 in 1944 and to 172,345 in 1949. All army conscripts are offered BCG; nurses who are tuberculin negative are refused admission to hospital services and referred for BCG vaccination. To date "the total number of individuals who have been vaccinated once may be assessed at about 1,000,000," according to the International Union Against Tuberculosis.

In Denmark, adds Birkhaug, BCG vaccination, which began in 1927, was reserved for children and adults living in tuberculous surroundings. It was not until Denmark was drawn into World War II that BCG was used extensively. Between 1940 and 1944 BCG vaccination in Denmark had increased to such an extent that practically all school children between the ages of ten and fourteen were ultimately vaccinated. According to Gravesen, Chief Physician of the Municipal Tuberculosis Hospital and Chest Clinic of Frederiksberg, in 1945 about 31,661 persons were vaccinated; in 1946, 101,798; and in 1949, 183,844.

That a tremendous number of persons are now being vaccinated with BCG, not only in Scandinavia but particularly in Central Europe lately, may be gathered from a news item in the New York Times recently which referred to the first phase of the "world immunization drive" inaugurated by the Danish Red Cross, the Norwegian Relief for Europe, and the Swedish Red Cross in cooperation with the United Nations International Children's Emergency Fund. Up to January 30, 1950, "almost 17,000,000 persons had been vaccinated following tuberculin testing of 37,000,000 persons."

SUMMARY

1) Tuberculosis mortality has been declining at an accelerated rate, especially during the past few years. Between 1945 and 1950, the death rate fell in England and Wales by 36 per cent; in the United States, 41 per cent; in Canada, 43 per cent; in France, 49 per cent; in Finland, 50 per cent; Italy, 53 per cent; Norway, 55

per cent; Denmark, 58 per cent; Sweden, 63 per cent; Iceland, 71 per cent; and in the Netherlands, 78 per cent.

2) Tuberculosis morbidity, on the other hand, has tended to remain on a high level: 100,772 new cases reported in the United States in 1940 and 121,228 in 1950; in Canada, 10,226 formerly and 12,429 lately; in England and Wales, 49,967 notifications ten years ago and 52,062 last year; in Denmark, 2,687 new pulmonary cases in 1940 and 2,507 in 1950. Effective prevention of tuberculosis obviously remains elusive so far.

3) Improved forms of treatment in tuberculosis are responsible for the lowering of "community case fatality rates" which ranged between 50 and 60 per cent in 1940, but were reduced in 1950 to 31 per cent in England and Wales, 29 per cent in Scotland and in Canada, 28 per cent in the United States, and only 20 per cent in Denmark.

4) Children have generally enjoyed greater reductions of tuberculosis mortality than older groups of the population. Their death rate in the United States, in spite of an increasing concentration of population in urban, congested centers and large Negro groups has been steadily reduced. Among those under 15 years of age, in the year 1949 it averaged for the entire country 3.9 per 100,000. In the state of Minnesota, it was as low as 1.3. Abroad, the same year, the death rate of the children in Denmark was 3.6; but, in Norway, it was 8.1; and in England and Wales 12.1.

5) BCG vaccination has been widely used in the Scandinavian countries—little in Iceland—and only very recently to any extent in the United States or in England and Wales.

6) In the state of New Jersey, special measures for the protection of school children—periodic x-ray examination of school personnel along with tuberculin testing and x-raying of pupils annually—resulted in 1949 in reducing the death rate of children under 15 to 2.7 or only one-third of that prevailing in Norway. The death rate of the children in Denmark was 44 per cent of that of Norway.

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urdsson, Medical Director, Tuberculosis Control, Iceland; Dr. Norman Smith, Deputy Senior Medical Officer, Ministry of Health, England; Dr. J. Ch. W. Verstege, Deputy Director General, Netherlands Central Bureau of Statistics.

RESUMEN

1) La mortalidad por tuberculosis ha venido descendiendo a un paso acelerado, especialmente durante los últimos años. Entre 1945 y 1950 el índice de mortalidad en Inglaterra y Gales fué de 36 por ciento; en los Estados Unidos de 41 por ciento; en el Canadá de Sweden National Association against Tuberculosis; Dr. Sigurdur Sig- 43 por ciento; en Francia de 49 por ciento; en Finlandia de 50 por ciento; en Italia de 53 por ciento; en Noruega de 55 por ciento; en Dinamarca de 58 por ciento; en Suecia de 63 por ciento; en Islandia de 71 por ciento; y en Holanda de 78 por ciento.

2) Por otra parte, la morbilidad de la tuberculosis ha tendido a permanecer en un alto nivel: 100,772 casos reportaron los Estados Unidos en el año de 1940, y 121,228 en 1950; en Canadá 10,226 inicialmente y 12,429 más tarde; en Inglaterra y Gales 49,967 notificaciones hace diez años y 52,062 el año pasado; en Dinamarca 2,687 nuevos casos pulmonares en 1940 y 2,507 en 1950. La prevención efectiva de la tuberculosis obviamente permanece fuera de alcance hasta hoy.

3) Las mejores formas de tratamiento en tuberculosis, son responsables del descenso del "Indice de casos fatales de la Comunidad," los cuales oscilan entre 50 y 60 por ciento en el año de 1940, pero fueron reducidos en 1950 a 31 por ciento en Inglaterra y Gales, 29 por ciento en Escosia y Canadá, 28 por ciento en los Estados Unidos, y solo 20 por ciento en Dinamarca.

4) Los niños, generalmente han gozado de grandes reducciones en mortalidad por tuberculosis, comparando con otro groups de población. Su porcentaje de muerte en los Estados Unidos, a despecho de una concentración creciente de población urbana, centros congestionados, han sido a pesar de todo, reducidos. Entre ellos, en edades de 15 años, por el año de 1949 el porcentaje en todo el país fué de 3.9 por 100,000. En el Estado de Minnesota fué tan bajo, que arrojó un porcentaje de 1.3. En Europa el mismo año, el índice de mortalidad en los niños, en Dinamarca fué de 3.6; pero en Noruega fué de 8.1 y en Inglaterra y Gales de 12.1.

5) La vacuna BCG ha sido extensamente usada en los países escandinavos—poco en Islandia—y solo muy recientemente, con cierta amplitud en los Estados Unidos o en Inglaterra y Gales.

6) En el Estado de Nueva Jersey las medidas especiales para la protección de los niños escolares—examen periodico de Rayos X del personal escolar, junto con pruebas de tuberculina y examen radiológico anual de los alumnos—dieron como resultado en 1949

la reducción de la mortalidad de los niños menores de 15 años hasta 2.7, o sea solo una tercera parte de la que prevalece en Noruega. El índice de mortalidad infantil en Dinamarca fué de 44 por ciento del de Noruega.

RESUME

1) La mortalité tuberculeuse a diminué dans des proportions accélérées, surtout dans ces toutes dernières années. Entre 1945 et 1950, les statistiques de mortalité ont diminué de 36% en Angleterre et dans le pays de Galles, de 41% aux Etats-Unis, de 43% au Canada, de 49% en France, de 50% en Finlande, de 53% en Italie, de 55% en Norvège, de 58% au Danemark, de 63% en Suède, de 71% en Islande, et de 78% aux Pays-Bas.

2) D'autre part, la morbidité tuberculeuse a tendance à rester à un niveau élevé: 100,772 nouveaux cas avaient été dénombrés en 1940 aux Etats-Unis, et 121,228 en 1950; au Canada, 10,226 cas avaient été notés autrefois, et plus tard 12,429; En Angleterre et dans le pays de Galles, il y eut 49,967 cas constatés il y a dix ans, et 52,062 l'année dernière; au Danemark 2,687 nouveaux cas de tuberculose pulmonaire furent enregistrés en 1940 et 2,507 en 1950. Il est évident que jusqu'à présent on n'a pas pu réaliser une prophylaxie véritable de la tuberculose.

3) Les progrès de la thérapeutique sont responsables de l'abaissement de la mortalité dans les cas considérés antérieurement comme désespérés, qui représentaient de 50 à 60% des cas en 1940 et qui ont été réduits en 1950 à 31% en Angleterre et au pays de Galles, à 29% en Ecosse et au Canada, à 28% aux Etats-Unis, et seulement à 20% au Danemark.

4) Chez les enfants, on a généralement remarqué une plus grande réduction de la mortalité tuberculeuse que chez les éléments plus âgés de la population. Leurs statistiques de mortalité aux Etats-Unis ont été réduites de façon très notable, malgré la concentration croissante de la population dans des centres urbains surpeuplés. Parmi ces enfants, si l'on considère ceux qui sont âgés de moins de 15 ans, le pourcentage de mortalité pour tous les pays en 1949 n'a pas dépassé 3.9 pour 100,000. Dans l'état de Minnesota, ce pourcentage s'est abaissé à 1.3. A l'étranger la même année, la statistique de mortalité des enfants était de 3.6 au Danemark alors qu'elle était en Norvège de 8.1 et en Angleterre et au pays de Galles de 12.1.

5) La vaccination par le B.C.G. a été utilisée largement dans les pays scandinaves, à peine en Islande et seulement depuis peu aux Etats-Unis ou en Angleterre et dans le pays de Galles.

6) Dans l'état de New-Jersey, des mesures spéciales de protection des enfants des écoles ont été prises: examens périodiques au

rayons X du personnel scolaire, et pour les élèves recherche des réactions tuberculiniques et examens radiologiques. Il en est résulté en 1949 une réduction du pourcentage de mortalité des enfants de 15 à 2.7, c'est-à-dire le tiers seulement des chiffres de Norvège. La mortalité des enfants au Danemark a été plus basse de 44% par rapport à celle de la Norvège.

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Treatment of Abscesses Associated with Spinal Tuberculosis*

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The fundamental principles in the treatment of abscesses associated with tuberculosis of the spine have not changed appreciably since 1779 when Percival Pott wrote about tuberculosis of the spine. In his writings of that year Pott described palsy of the lower limbs frequently found to accompany curvature of the spine, and that syndrome was then known as Pott's Paraplegia. Pott did not believe that the curvature of the spine exerted any influence on the palsy, stating categorically that an abscess was responsible and that drainage of the abscess usually brought relief from the symptoms. He did not wait for spontaneous drainage of the abscess, but performed surgical drainage by means of cauterization and setons. At that time, the cause of tuberculosis of the spine was not known; it was not until 100 years later that the tubercle bacillus was isolated. Going back farther into the ancient medical literature, we find that Hippocrates described paralysis of the lower limbs cured by an abscess in the back or loins. Thus we see that the cause of this distressing complication in tuberculosis of the spine and measures to relieve it were clearly presented about two centuries ago.

Regardless of what type of procedure has been used for this condition of the spine, the basic principles for the treatment of tuberculosis of the bone and joint, so well emphasized in the teachings of H. O. Thomas, who advocated "rest, enforced, uninterrupted and prolonged," have not varied to any great extent in present day medicine.

Before the use of streptomycin, individuals having abscesses and sinuses associated with tuberculosis of the spine, often had serious and sometimes fatal complications. Many procedures were recommended for their control, but all were characterized by poor therapeutic response. Aspiration and surgical excision of sinuses and abscesses were often followed by recurrence and secondary infection.

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The foci of the soft tissue infection, so near the site of the tuberculosis spondylitis, prohibited the performance of any spinal fusion without considerable risk to the patient. Therefore, in the majority of cases, spinal fusion had to be abandoned, and the only alternative program was rigid immobilization in a plaster body jacket. This conservative treatment required many years, and then if spinal fusion was performed, numerous cases had recurrence of bone destruction, either at the original site or in another area of the spine.

Since the first recorded description of tuberculosis of the spine, when treatment for relief of the occasional resulting paraplegia was aspiration of the abscess, many varied treatments, both medical and surgical, have been tried. As medicine progressed, some treatments were discarded, and others modified. Various methods, such as lamenectomies, and aspiration and eradication of the abscesses were used to relieve pressure on the spinal cord. Each procedure was usually accompanied by some form of internal fixation of the involved vertebrae, but they often resulted in complications due to secondary infection. It was not until 1944, with the advent of streptomycin, that treatment of tuberculosis of the spine, both conservative and surgical, progressed. With this new drug, surgical procedures for tuberculosis of the spine and for eradication of the abscesses and sinuses, first described two centuries ago, can again be used, only now without fear of serious complications.

With streptomycin as an adjunct, early eradication of sinuses and abscesses associated with tuberculosis of the spine not only shortens the time prior to spinal fusion, and decreases the percentage of recurrent boney lesions, but also lessens the period of convalescense and hastens rehabilitation of the patient back to normal life.

Pathology

A. *Vertebral:*

Tuberculous lesions can occur in any part of the spine. However, the cervical and sacral vertebrae are involved less frequently than the dorsal and lumbar.

In tuberculosis of the spine, the disease starts in either the central, epiphyseal, or the anterior area of the vertebral body. It rarely begins in the posterior arch or transverse process. In the majority of cases the disease is of the central type.

In the central type of disease, the lesion starts in the center of the body of the vertebrae and by means of extension, spreads through and destroys the cancellous bone until the infection reaches the cortex. When the tuberculous tissue invades and

penetrates either the anterior or posterior cortex of the vertebrae, it accumulates beneath the anterior or posterior longitudinal ligament which is stripped from the bone and from the adjacent intervertebral disc. The tuberculous lesion thus may invade the bodies of the vertebrae, either above or below, without passing through the intervertebral disc. The tuberculous tissue may penetrate the posterior longitudinal ligament, and spread over or completely encircle the dura of the spinal cord at the level of the disease.

When the lesion is of the epiphyseal of intervertebral articulating type, the disease begins in the upper or lower surfaces of the body, invades the intervertebral disc, and spreads through the nucleus pulposus to the adjacent vertebrae.

In the anterior vertebral involvement, the tuberculous lesion begins in or near the anterior cortex, and extends up and down the spine beneath the anterior spinal ligament, and thereby penetrates and erodes the anterior portion of the adjacent vertebral bodies.

B. *Abscesses:*

In the formation of tuberculous abscesses, regardless of whether the boney lesion is in the central, epiphyseal, or anterior area of the vertebral body, the epithelioid cells and tubercle bacilli invade the surrounding non-tuberculous inflammatory tissue and either form more tubercles or produce tuberculous inflammatory tissue, which contains large numbers of epithelioid cells. The highly cellular tuberculous inflammatory tissue invades the surrounding tissue. Even bone cartilage and dense fibrous tissue offer only a temporary barrier to its progress. The periphery of this mass is so highly vascular, and the central portion so congested with cells that obliterate the blood vessels, that consequently this area degenerates and a tuberculous abscess forms.

The abscess cavity contains cell debris, caseous material, and liquid which is purulent in character. During the active stage of the disease, the wall of the abscess which is composed of tuberculous granulation tissue, backed by fibrous connective tissue, secretes, or at least permits the passage of fluid into the cavity. The abscess increases in size, and burrows through the surrounding tissue following the path of least resistance. In so doing, a definite limited wall is maintained until it ruptures through the skin, expells its contents, and its wall collapses. The channel of the tuberculous tissue may persist as a sinus as long as the disease is active. In some instances the disease may quiet down, and the abscess may decrease in size as its contents become more dry, and calcium may be deposited in its avascular wall.

As the abscess enlarges, it may generate much internal pressure before it finds its way to a soft yielding area where the pressure is dissipated. Abscesses which arise above the diaphragm tend to remain in the chest cavity or to point posteriorly. Those which arise below the diaphragm tend to enter the pelvis along the sheath of the iliopsoas muscle and may point in the groin or thigh, or they may burrow posteriorly and appear in the lumbar region.

Illustration 1a shows a descriptive drawing of the four most common tuberculous abscesses: One, paravertebral, usually involving from the fifth to the 10th vertebrae; Two, psoas abscess with its origin in the 12th dorsal and first and second lumbar; Three, "Cold abscess," but a better term would be tuberculous abscess of the lumbar area, with its origin in the third, fourth and fifth lumbar; Four, multiple subcutaneous tuberculous abscesses, associated with dorsal spine involvement.

Treatment

In the pre-operative treatment of tuberculosis of the spine with associated abscesses or sinuses, the patient must be put on a regime of complete bed rest with adequate external immobilization. The individual having tuberculosis of the dorsal spine should be put into a bi-valve plaster body cast extending from the

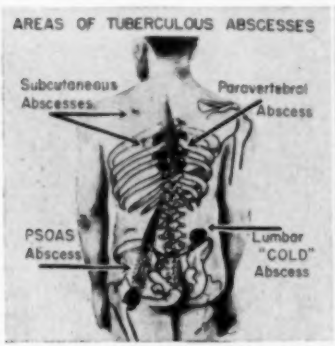

FIGURE 1a

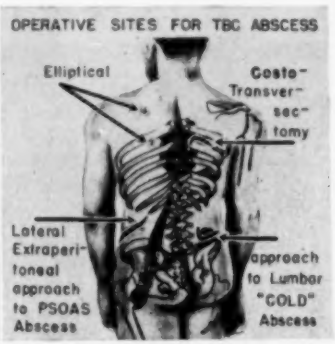

FIGURE 1b

Figure 1a shows a descriptive drawing of the four most common tuberculous abscesses: One, paravertebral, usually involving from the 5th to the 10th vertebrae; Two, psoas abscess with its origin in the 12th dorsal and 1st and 2nd lumbar; Three, "cold abscess," but a better term would be tuberculous abscess of the lumbar area, with its origin in the 3rd, 4th and 5th lumbar; Four, multiple subcutaneous tuberculous abscesses, associated with dorsal spine involvement.—*Figure 1b* shows the operative sites and skin incisions of a costotransversectomy for the paravertebral abscess; lateral extraperitoneal for the psoas abscess; concave or L-shaped incision for the lumbar abscess; and the elliptical for the subcutaneous abscess.

occipital region to just above the knee with the thighs in slight abduction. The anterior portion should include the chin only. The individual with tuberculosis of the lumbar spine associated with either psoas or lumbar abscess should be incorporated in a body cast extending from the shoulders to the knees with the hips slightly flexed. The patient remains immobilized in the cast until ankylosis occurs following spinal fusion. Prior to surgery the patient must be put into the best possible physical condition. All deficiencies in blood levels must be corrected. The patient should be placed upon a high protein and high caloric regime. Streptomycin is administered only during the surgical period, which means for one week prior to surgery and approximately two weeks after, or until the healing of the surgical area is complete and the temperature becomes normal. Streptomycin is given intramuscularly in two divided doses of one gram daily. In addition, 24 hours before surgery, 300,000 units of penicillin are given intramuscularly, and also continued following surgery until the wound is completely healed and the temperature remains normal.

If spinal fusion is to follow within four weeks after the wound has healed, streptomycin therapy is continued, one gram intramuscularly every 72 hours until fusion, and then one gram daily with penicillin covering the surgical period.

With the paravertebral abscess, if the x-ray film shows the abscess shadow to be enlarging, aspiration should be tried first.

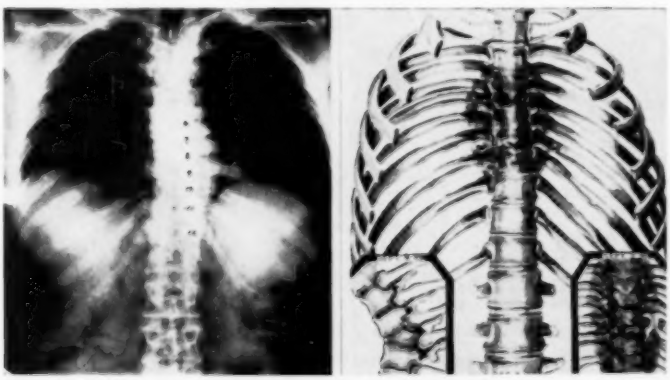

FIGURE 2a FIGURE 2b

Figure 2 shows an anterior and posterior: (a) X-ray of the thoracic cage including the dorsal spine with the paravertebral abscess situated between the 6th and 10th dorsal vertebrae. The (b) drawing illustrates diagrammatically the area involved. The two inserts of the drawing show the lateral and anterior and posterior views one year later which reveal an increase of boney structure in the area of the old lesion.

If aspiration is unsuccessful, whether or not there are any neurological symptoms present, costotransversectomy is performed. In this procedure, a complete incision and drainage of the abscess must be carried out, removing the granulation tissue and any presenting sequestra. A small rubber drain is left in the wound for 72 hours. The wound usually heals over completely within 14 days.

In cases of dorsal tuberculosis of the spine associated with paravertebral abscess which came under our observation several years after the original spinal fusion, complications such as paraplegic syndrome, recurrence of bone destruction in the original as well as in a new site, and cutaneous abscesses in the dorsal area, led us to believe that the initial surgical procedure prior to any fusion should be the eradication of any abscess. Tuberculous abscesses and sinuses associated with spinal involvement present a possibility of local foci or re-infection unless eradicated.

The psoas abscess, which is a deep, burrowing, extension process situated along the sheath of the iliopsoas muscle and usually extending from the lesion of the 12th dorsal, and first and second lumbar to the insertion of the psoas muscle in the lesser trochanter of the femur, can be excised in its entirety through a lateral extra-peritoneal approach. In cases of this type of abscess that have been followed in our series, all have presented themselves secondarily following the original spinal fusion. Prior to

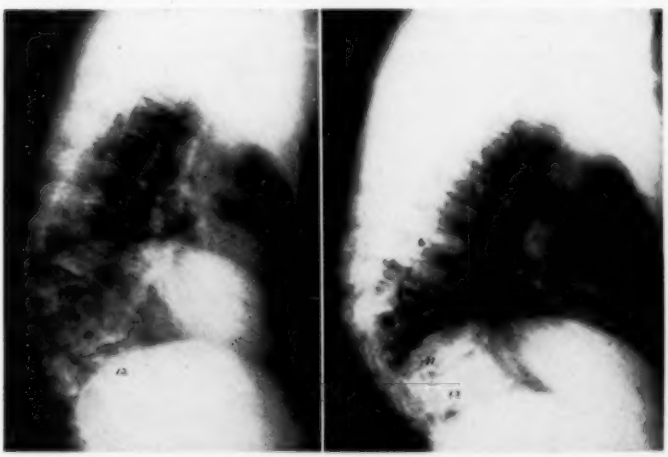

FIGURE 3 shows a case of a male, age 52 years, having tuberculosis of the dorsal spine with the apex of the curvature in the region of the 8th dorsal vertebra.

surgery diotrast studies can be performed to reveal the abscess. This can easily be done by aspirating the abscess along its insertion at the lesser trochanter of the femur, and then injecting the contrast media. Even though incision and drainage of the abscess can be performed by means of a posterior incision along the lateral aspect of the transverse process of the upper lumbar spine, the abscess will recur unless it is entirely removed. When the surgical procedure is done, any sinuses extending from the original abscess must also be eliminated, or a new one may form. The wounds in these cases are closed.

The "cold" or lumbar abscess which is usually associated with tuberculous involvement of the third, fourth, and fifth lumbar vertebrae may recur if only aspiration is performed. It is necessary to remove the entire soft tissue lesion as well as the finger projection that leads to the boney lesion. If the abscess can not be totally removed, then careful disection must be performed to remove all granulation tissue to prevent recurrence. These wounds are also closed.

For multiple posterior tuberculous sinuses and subcutaneous abscesses which are usually found in the dorsal area of the back, complete debridement must be carried out. All granulation tissue must be removed until only healthy tissue remains. In these cases the wounds are left open, and under streptomycin therapy they close completely.

Following the surgical procedure in the psoas, the lumbar, and

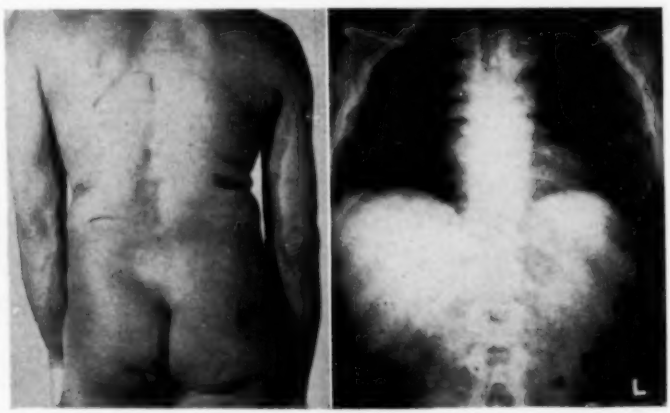

FIGURE 4 is the case of a male, age 39 years, who had a history of tuberculosis of the dorsal spine for five years, had been treated conservatively in various hospitals throughout the country.

the multiple sinuses, 1 gram of streptomycin is usually instilled into the wound before closing.

Illustration 1b shows the operative sites and skin incisions for costotransversectomy for the paravertebral abscess, lateral extraperitoneal for the psoas abscess; concave or L-shaped incision for the lumbar abscess; and the elliptical for the subcutaneous abscess.

*Presentation of Cases**

The following cases from each group illustrate the importance of early excision of the tuberculous abscess or sinus associated with spinal involvement.

A. *Paravertebral:*

A male, age 36 years, had a history of tuberculosis of the mid dorsal spine with paravertebral abscess which was discovered three years previously. Treatment during the three years consisted of immobilization in a plaster jacket, followed by a back brace which allowed him to be semi-ambulatory. His general condition had been good until two months prior to admission, when he began to have symptoms of early onset of paraplegia. Twenty-four hours before admission he became completely paralyzed below the level of the sixth dorsal segment with loss of bladder and rectal control. On admission he was placed on regular tuberculosis regime, including complete immobilization in a plaster body jacket. Streptomycin therapy of 1 gram daily intramuscularly was administered. Aspiration of the paravertebral abscess was attempted but with no relief of symptoms. Four days following the beginning of streptomycin therapy, costotransversectomy was performed in the region of the sixth thoracic vertebra. The paravertebral abscess was drained and the sequestra was removed from the anterior area of the vertebral body. One gram of streptomycin was instilled into the wound, a drain was inserted into the wound for 72 hours, and the wound completely healed over in 14 days.

*From City of Hope; Cedars of Lebanon Hospital; Birmingham Veterans Administration Hospital.

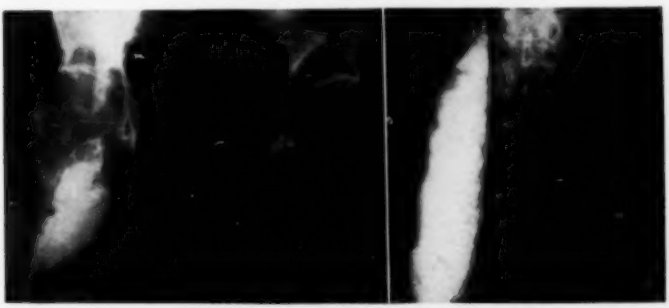

FIGURE 5 shows a diotrast study which reveals the psoas abscess leading from the 2nd lumbar vertebra to the lesser trochanter of the femur.

FIGURE 6 *b*: of a patient having a lesion in the 3rd and 4th lumbar vertebrae. The anterior and posterior and lateral x-rays show the extent of the boney lesion. The diotrast study shows the extent of the boney lesion.

Illustration 2 shows an anterior and posterior (a) x-ray film of the thoracic cage including the dorsal spine with the paravertebral abscess situated between the sixth and tenth dorsal vertebrae. The (b) drawing illustrates diagrammatically the area involved. The two inserts on the drawing show the lateral, anterior and posterior views one year later which reveal an increase of boney structure in the area of the old lesion. The lateral drawing shows the marked angulation caused by destruction of the bodies of the vertebrae.

Twenty-one days post-operatively, the paraplegic condition had subsided and 30 days post-operatively he had complete restoration of the bladder, rectum and lower extremities. Histopathology and bacteriology of the material removed from the abscess were positive for tuberculosis.

He was kept immobilized in a plaster body jacket, and nine months after the eradication of the abscess, spinal fusion was performed, streptomycin again being used as an adjunct. Fifteen months post-surgery, he was ambulatory and wearing a Taylor brace.

Present status, three years and eight months post-surgery, he is working, his general condition is good, and the only residual is a mild clonus of his right ankle, which, no doubt, is the result of a permanent injury that occurred at the time the abscess had exerted pressure on his spinal cord.

Illustration 3 shows a case of a male, age 52 years, having tuberculosis of the dorsal spine with the apex of the curvature in the region of the eighth dorsal vertebra. The lesion was first diagnosed 10 years prior to this admission. Previous treatment had been conservative with immobilization in a plaster body jacket. As his general condition improved and the x-ray films showed evidence of bone healing, he had been allowed to return to his occupation. During that period he had two recurrences of the old lesion which each time caused his return to the hospital. Prior to the last admission in 1948, he had periods of transient symptoms of early paraplegia. On the present admission, there were definite signs of neurological involvement of his lower extremities. In this case there was a small paravertebral abscess. Under incision, drainage, and eradication of the abscess and with streptomycin therapy as an adjunct, the paraplegic symptoms subsided. Nine months after this treatment, spinal fusion was performed in two stages. Now, three years later, he is fully ambulatory, back at his job, and his x-ray films continue to show evidence of good boney structure in the original tuberculosis site. The illustration shows x-ray films taken at the time of his last admission, and two years later when good boney healing can be seen.

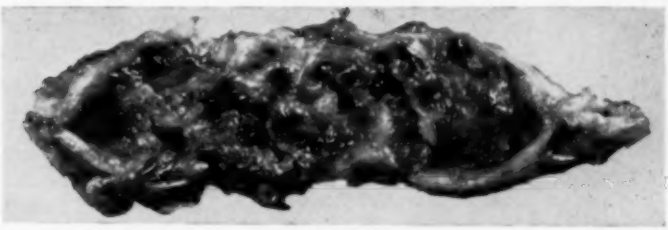

FIGURE 7 is a photographic study of a psoas abscess specimen which was entirely removed by a lateral extra-peritoneal approach.

Illustration 4 is the case of a male, age 39 years, who had a history of tuberculosis of the dorsal spine for five years, had been treated conservatively in various hospitals throughout the country. On his present admission, x-ray films showed involvement of the mid-dorsal area as illustrated. There also were eight subcutaneous abscesses located throughout his back and gluteal area, which had ruptured and were draining. These are illustrated in the photograph. In addition to immobilization in a plaster jacket, total debridement was done upon each sinus along with streptomycin therapy and into each area streptomycin was injected locally. Streptomycin was continued until all wounds healed over completely which required 29 days. Now, two years and eight months following surgery for the abscesses, he is going to school learning a trade compatible with his physical status.

In the first case in this group, we feel that if originally the paravertebral abscess had been eradicated, the chance of having a breakdown six years later, with the possibility of a fatal paraplegic complication, could have been avoided. Fusion in this case, six years ago, might have avoided the recurrence, but many of the cases under our observation in which there had been fusion without removal of the abscess showed recurrent breakdown of the old lesion. This same analysis can be brought out for case 2 and case 3 which emphasizes to us that early treatment of the abscess is vital.

B. *Psoas Abscess:*

In this group, illustration 5 is shown a diotrast study which reveals the psoas abscess leading from the second lumbar vertebra to the lesser trochanter of the femur. The tuberculous lesion was in the 12th dorsal and first and second lumbar vertebra. This individual has a bilateral psoas abscess extending from the second

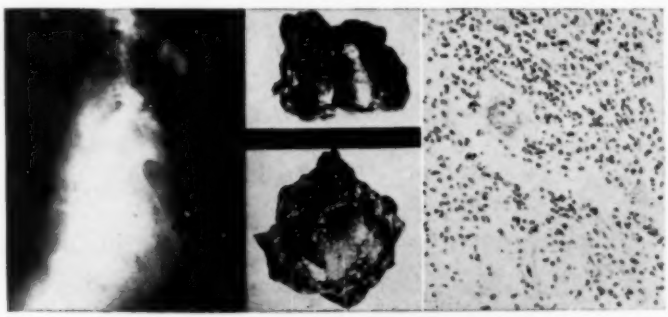

FIGURE 8a FIGURE 8b FIGURE 8c

Figure 8: (a) is a lateral x-ray showing diotrast study of the abscess.—(b) reveals the surgical specimen.—(c) is a photograph of the micropathological study.

lumbar to the lesser trochanter. Two years prior to admission a diagnosis had been made of tuberculosis of the spine in the lower dorsal and upper lumbar vertebra, with a psoas abscess on the left. Fusion had been performed for the spinal lesion one year before, but the abscess had not been removed.

Surgical eradication of the abscess was done with adjunctive streptomycin therapy. Three years since the last surgery he is fully ambulatory, has had no recurrence, and is gainfully employed.

Illustration 6 is of a patient having a lesion in the third and fourth lumbar vertebrae. The anterior-posterior and lateral x-ray films show the extent of the boney lesion. The diotrast study reveals the extent of the abscess. The abscess was eradicated under surgical procedure and was followed by spinal fusion several months later. Streptomycin therapy was used in each procedure.

Illustration 7 is a photographic study of a psoas abscess specimen which was entirely removed by a lateral extra-peritoneal approach.

In our series of psoas abscesses associated with lower dorsal and upper lumbar spine disease, the majority of cases had conservative treatment with immobilization in a plaster cast and followed by spinal fusion. Each one had a recurrence of the old lesion with a psoas abscess forming. In this group as well as in the paravertebral, the possibility of psoas abscess at the time of the original lesion must be considered as a probable local focus of infection causing the recurrence. The importance of eliminating the psoas abscess during the original procedure is again pointed out.

C. *Lumbar Abscess:*

Illustration 8 shows a lateral x-ray film revealing evidence of a tuberculous lesion in the third and fourth lumbar with a diotrast study of a lumbar abscess associated with the lesion. Many needle aspirations were done, only to have recurrences of abscess formation. Total eradication of the abscess was performed. The illustration shows the specimen removed, both whole and opened, revealing the caseous material. The photomicrograph of the tissue of the abscess reveals epithelioid cells, a Langhans type giant cell, and peripheral zone of lymphocytes.

In this case eradication of the abscess and spinal fusion were performed in one procedure. It is our opinion that this should be done in two stages; the abscess removed first and then spinal fusion.

In the cases which we have observed in this group and which have had recurrences of boney lesions, all had associated lumbar

abscesses. Therefore, we feel that in this group, as well as in all the others, early eradication of the abscess will lessen the percentage of recurrent boney lesions.

SUMMARY

Tuberculous abscesses and sinuses associated with involvement of the spine present a possibility of local foci of re-infection unless eradicated.

Streptomycin therapy as an adjunct enables us to eradicate totally these abscesses without fear of secondary infections.

Streptomycin should not be used as a conservative measure to eliminate these abscesses; but to get the best possible results, the abscesses must be totally removed, or opened widely to secure adequate drainage. Sinuses must also be widely opened, and the tuberculous granulations and adjacent fibrous tissue removed, leaving only normal tissue.

Serious complications due to paravertebral abscesses have shown that early eradication of the abscesses is necessary for complete recovery.

Removal of the psoas abscess and its accompanying sinus tract have lessened the chance for recurrence of the original boney lesion.

Total removal of the "cold" or lumbar abscess instead of aspiration has proved to be a necessary step prior to fusion.

Streptomycin should be considered only as an adjunct to the surgical treatment of tuberculous lesions of the vertebral column, and not a substitute for "rest, enforced, uninterrupted, and prolonged."

Surgical procedures for the skeletal tuberculous lesions as well as for the abscess and sinuses can be carried out earlier in the course of the disease with the adjunctive use of streptomycin.

RESUMEN

Los abscesos tuberculosos y las fistulas asociadas con lesión de la columna vertebral, presentan una posibilidad de focos locales de reinfección, a menos que sean extirpados.

La estreptomicina como tratamiento adjunto, nos permite extirpar totalmente estos focos, sin temor a infecciones secundarias.

La estreptomicina no debe emplearse como método conservado para eliminar estos abscesos. Para obtener los mejores resultados los abscesos deben ser extirpados por completo, o abiertos ampliamente para asegurar la buena canalización.

Las fistulas deben también abrirse con amplitud, y las granulaciones tuberculosas, extirpadas; el tejido fibroso adyacente, resecado, dejando solo el tejido normal.

Las serias complicaciones debidas a los abscesos paravertebrales han mostrado que la eradicación temprana de los abscesos, es necesaria para la completa curación.

La extirpación de los abscesos del psaos y de su trayecto fistuloso acompañante han disminuido las posibilidades de recurrencia de la lesión osea original.

La remoción completa del absceso "frío" o absceso lumbar en lugar de la aspiración ha demostrado ser un paso necesario antes de la fusión.

La estreptomicina debe considerarse solo como un tratamiento adyuvante de la terapéutica quirúrgica de las lesiones tuberculosas de la columna vertebral, y no un substituto para el "reposo obligado, ininterrumpido y prolongado."

Los procedimientos quirúrgicos para las lesiones de la tuberculosis del esqueleto, así como para el absceso y fístulas, pueden ser llevados a cabo más temprano en el curso de la enfermedad, con el empleo auxiliar de la estreptomicina.

RESUME

Les abcès tuberculeux et les adénopathies ganglionnaires associés à l'atteinte du rachis représentent un foyer local de réinfection possible, tant qu'ils ne sont pas radicalement supprimés.

La tsreptomycinothérapie n'est pas capable d'assurer cette disparition sans crainte de voir apparaitre des infections secondaires.

On ne peut pas compter sur la streptomycine pour éliminer peu à peu ces abcès. Pour obtenir le meilleur résultat, les abcès doivent être extirpés en totalité ou largement ouverts pour en permettre le drainage.

Les adénopathies doivent également être largement ouvertes et les granulations tuberculeuses, ainsi que le tissu fibreux adjacent doivent être supprimés. Seul doit subsister le tissu normal.

Les graves complications dues aux abcès paravertébraux ont montré que pour obtenir la guérison complète, il faut une exérèse précoce des abcès. La suppression des abcès du psoas et des éléments lymphatiques qui l'accompagnent à diminué considérablement les rechutes de la lésion osseuse primitive.

L'extirpation totale des abcès froids ou des abcès lombaires utilisée à la place de l'aspiration s'est montrée une première et nécessaire étape, précédant leur disparition définitive. La streptomycine ne doit être considérée que comme un élément auxiliaire du traitement chirurgical des lésions tuberculeuses de la colonne vertébrale. Elle ne peut se substituer au repos absolu, ininterrompu et prolongé.

Les techniques chirurgicales de traitement des lésions tuberculeuses du squelette, aussi bien que les abcès et adénopathies peuvent

être entreprises plus précocément au cours de l'évolution, grâce à l'utilisation associée de streptomycine.

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The Present Status of Phrenic Nerve Paralysis in the Treatment of Pulmonary Tuberculosis*

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The popularity of phrenic nerve paralysis as a collapse procedure in the treatment of pulmonary tuberculosis has intermittently waxed and waned for almost 40 years. There was a time when this operation was employed almost routinely in some institutions. Today, however, the procedure is utilized considerably less frequently and with more discrimination than in former times.

During recent years, the place of phrenic nerve interruption has become more and more that of an adjunct to other forms of collapse therapy, as for example, pneumoperitoneum. Moyer[1] has recently pointed out the extreme value of this combination, pneumoperitoneum and phreniclasia, in certain cases. This appears to be especially true in the group of patients seriously ill with bilateral disease in which the only therapeutic alternative would be bed rest with or without antibiotic therapy. In his 550 patients, pneumoperitoneum was combined with temporary phrenic nerve interruption on the side most involved and excellent results were obtained in a large percentage of cases. Great caution is always advised in the use of a temporary phrenic paralysis in the presence of extensive bilateral disease. It must be remembered that the procedure is not always reversible and that on the average it takes six months before the function returns. There are times when the side with the lesser disease becomes the most important side to have at rest. If this situation develops, a rapid change in the plan of therapy is impossible.

Paralysis of the hemidiaphragm as a therapeutic measure in pulmonary tuberculosis was first performed by Stuertz[2] in 1911. His original operations consisted of division or partial resection of the main phrenic nerve trunk in an effort to produce permanent paralysis. A large proportion of patients subjected to this operation (phrenicotomy) continued to have normal diaphragmatic movement, or soon had return of diaphragmatic function.

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This failure to produce paralysis in all cases by simple division was explained by Felix,[3] and by Goetze,[4] who independently demonstrated the presence of one or more accessory phrenic nerves in a large number of cases. They devised operations to bring about complete and permanent paralysis by means of interrupting not only the main phrenic trunk, but all accessory phrenic nerves as well. The main phrenic nerve typically arises from the third, fourth and fifth cervical roots while the smaller, so-called accessory phrenic nerves are actually small roots, as a rule, that arise from the fifth or possibly the fourth cervical root and join the main phrenic trunk more distally in its course. The clinical significance of these accessory roots is that if their connection with the diaphragm is not interrupted at the same time that the main phrenic trunk is paralyzed they may develop within a few days or months sufficient compensatory power to maintain partial or full motor function of the diaphragm.

Indications for Phrenic Paralysis

The indication for phrenic nerve operation, broadly considered, is essentially the same as for other forms of collapse therapy, namely, an active pulmonary lesion which might be expected to improve following pulmonary relaxation and rest. There is great individual variation in opinion among phthisiologists concerning the indications for this operation; in some clinics the procedure is used with great frequency whereas in other institutions it has been practically abandoned. Matson and Conklin[5] state that phrenic nerve interruption may be considered under the following conditions:

1) As an adjunct to bed rest and sanatorium treatment in early lesions, especially those for which artificial pneumothorax is impossible.

2) In some cases with cavity in which artificial pneumothorax is the treatment of choice, but cannot be established, and who are not suitable for major surgery.

3) By some authorities it is considered the procedure of choice when the lower lobe is preponderantly involved. It is contraindicated, however, when there is associated suppurative disease, since it interferes with efficient expectoration.

4) Phrenic interruption may be used as an adjunct to artificial pneumothorax when inoperable adhesions interfere with collapse and other measures such as thoracoplasty are contraindicated.

5) Paralysis of the hemidiaphragm may be used to promote obliteration of the pleural cavity when an artificial pneumothorax is being discontinued.

6) In some cases of pleural effusion, phrenic paralysis may be

used to promote resorption of the fluid, obliteration of the pleural cavity, and control of underlying pulmonary pathology, especially when an adequate pneumothorax can not be established.

7) In empyema, phrenic paralysis may be used to promote obliteration, or to reduce the size of the infected pocket prior to thoracoplasty.

Many authorities today would not agree with some of the indications given above, as for example number 4. When inoperable adhesions interfere with adequate collapse, an artificial pneumothorax should probably be immediately abandoned rather than attempt to improve the situation by diaphragmatic paralysis. Pneumothorax as a collapse procedure is now used much less commonly than formerly, thus the indications for phrenic paralysis as originally outlined by Matson and Conklin a few years ago must now be considered in this light. Also, this procedure is rarely used today in cases of pleural effusion (number 6).

Generally speaking, the operation may be used for any lesion upon which moderate relaxation and rest of the affected lung might reasonably be expected to exert a beneficial effect. This would probably include certain early lesions which should not be trusted to bed rest alone, and selected instances of small, thin-walled cavitary lesions. The individual phthisiologist's experience with this procedure will, of course, be of utmost importance and will probably be the deciding factor in determining which cases he selects for phreniclasia.

There are certain special situations in which phrenic paralysis has been used with considerable value such as to control pulmonary hemorrhage, to control persistent hiccough, to relieve diaphragmatic spasm, and to facilitate certain intrathoracic or intra-abdominal operations, i.e., repair of diaphragmatic hernia. The use of phreniclasia in conjunction with pneumoperitoneum has previously been mentioned and this now constitutes the principle indication for its use in many institutions. Trimble and his associates,[6] on the other hand, feel that it is rarely necessary to employ this procedure as an adjunct to pneumoperitoneum and believe it is definitely harmful in many instances.

There are many contraindications to the use of phrenic paralysis. These may be briefly summed up by stating that it should not be used if the amount of disease present in one or both lungs or the presence of any other factor or combination of factors has so greatly lowered the patient's vital capacity that the further reduction of respiratory reserve caused by phrenic paralysis might cause respiratory insufficiency. In addition, the long-range plan of therapy in each case must be considered, and if it is anticipated that major surgery such as thoracoplasty or resection may later

be required, it would probably be prudent to withhold phrenic nerve operation. Then, too, in elderly or emphysematous patients, this operation must be undertaken only after thoroughly evaluating pulmonary reserve. In the presence of endobronchial disease with or without stenosis, the additional angulation produced by diaphragmatic elevation resulting from phrenic nerve paralysis may be sufficient to interfere with adequate drainage and may convert an unblocked cavity into a blocked or tension cavity. This mechanism explains why cavities may enlarge in certain instances following phreniclasia.

Other than excessive reduction in respiratory function, the only significant complication of phrenic paralysis is gastro-intestinal distress ("phrenic dyspepsia"). This condition is not commonly seen and is rarely of serious significance.

Temporary Versus Permanent Phrenic Paralysis

Although permanent paralysis of the hemidiaphragm was the procedure employed for many years by means of avulsing or severing the nerve, this has now largely been replaced by temporary paralysis. This is produced by a simple crushing of the nerve. Paralysis induced in this manner usually persists from four to eight months. The nerve may then be recrushed if indicated, and this occasionally is performed a third time. Unfortunately, diaphragmatic function fails to return, either partially or completely, in a certain percentage of cases. Thus, temporary phrenic paralysis is not an entirely innocuous procedure and one must approach it with the realization that there exists a definite risk of permanent diaphragmatic paralysis. In a recent study of this subject from the patients in residence at the Veterans Administration Hospital, Oteen, North Carolina,[7] it was found that 53.5 per cent of patients who had undergone phreniclasia were left with some degree of permanent paralysis varying from slight to complete.

Technique of Operation

The details of the operative procedure will be described only briefly. Under local anesthesia, a 3 cm. incision is made parallel to the clavicle and 2 cm. above it with the midportion of the incision overlying the lateral border of the sternocleidomastoid muscle. The subcutaneous tissue and platysma are divided and the pre-scalene fat pad is penetrated. Care must be taken to avoid the external jugular vein which sometimes crosses the line of incision. Once the pre-scalene pad of fat has been divided, the phrenic nerve is usually readily recognized crossing the rounded belly of the scalenus anticus muscle. The fifth cervical root of

the brachial plexus is situated lateral to the muscle and is usually explored first to determine the presence or absence of accessory phrenic nerves. If found, these are divided unless quite large, in which case they are crushed. The main phrenic nerve is then crushed by means of a single firm application of a hemostatic forceps. This is rather important inasmuch as repeated clamping and chewing on the nerve undoubtedly greatly increases the incidence of permanent paralysis in these cases. The wound is usually closed with a few interrupted sutures of fine catgut for the muscle and a continuous subcuticular catgut suture for the skin. As an alternate either interrupted silk sutures or skin clips may be used to approximate the skin. Immediate post-operative fluoroscopy is performed to determine the degree of paralysis obtained. This is evidenced by elevation of the hemidiaphragm, absence or diminution in excursion, and paradoxical movement produced by sniffing.

SUMMARY

Temporary phrenic paralysis is occasionally indicated in certain selected cases in the modern treatment of pulmonary tuberculosis. This should only be performed following a consideration of the patient's long-range plan of therapy and possible future major surgical requirements. Permanent phrenic paralysis has very little place in the present-day treatment of pulmonary tuberculosis. However, the fact must be borne in mind that a definite percentage of attempted temporary phrenic paralyses will result in some degree of permanent impairment of diaphragmatic function.

RESUMEN

Ocasionalmente, la parálisis del frénico puede estar indicada en ciertos casos de tuberculosis pulmonar. Esta operación debe llevarse a cabo solo en vista de las escasas posibilidades terapéuticas del enfermo y en vista de la posibilidad de requerirse cirugía mayor en el futuro. La parálisis frénica permanente tiene poca aplicación en el presente en el tratamiento actual de la tuberculosis pulmonar. Sin embargo, debe tenerse presente que un porcentaje definido de parálisis del frénico temporal resultan en cierto grado de trastorno de la función del diafragma.

RESUME

Dans le traitement moderne de la tuberculose pulmonaire il existe encore certains cas particuliers pour lesquels une paralysie temporaire du phrénique reste indiquée. Une telle décision ne peut être prise qu'en considérant un traitement de longue haleine du malade, et les exigences possibles d'un acte chirurgical important

dans le futur. La paralysie définitive du phrénique n'a qu'une très petite place dans le traitement moderne de la tuberculose pulmonaire. Toutefois, il faut avoir à l'esprit la notion que dans un nombre de cas assez important de paralysies phréniques exécutées pour n'être que temporaires, la fonction diaphragmatique peut être dans une certaine mesure définitivement touchée.

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The Indications and Contraindications for Decortication Procedures in Pulmonary Tuberculosis

A Report by the
Sub-Committee on Surgical Treatment of Diseases of the Chest*

Purposes and Plans

This article constitutes a new departure by the Sub-Committee on the Surgical Treatment of Diseases of the Chest. The proposed plan is to formulate a composite discussion annually by the members of this committee on a new or controversial aspect of thoracic surgery. The primary premise is that a more authoratative presentation can be formulated in this manner than by any single author or from any individual clinic. It is planned that an open discussion be presented with equal emphasis upon favorable and unfavorable experiences with a new procedure. In particular it is hoped such a pooling of experiences may aid in analyzing failures at an earlier date, thus forestalling certain unfavorable results. The contributions by this committee constitute the composite opinions of this group only and do not necessarily constitute the opinions or decisions of the American College of Chest Physicians as a society. The formulation and editing of the material obtained is the responsibility of the chairman of the committee. However, the opinions expressed are those receiving unanimous approval of the contributing members. Where there occurs a major difference of opinion, or less than unanimous consent, the contradictory opinion or opinions by the dissenting members are also expressed.

Methods

The committee fully appreciates that in a new venture of this type certain unintentional inclusions or omissions may occur in this our first attempt. With increasing experience in this method, improved methods will undoubtedly occur. The present method consists of a canvassing of the committee to choose the subject

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*Contributing members: Drs. O. A. Abbott, Emory, Ga., Chairman; C. P. Bailey, Philadelphia, Penn.; E. B. Kay, Cleveland, Ohio; D. L. Paulson and R. R. Shaw, Dallas, Texas; D. H. Waterman, Knoxville, Tenn.

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Reprints of this report are available upon request to the Chairman.

for discussion. This year's topic was chosen for the following reasons: (1) Decortication procedures in tuberculosis have only recently received an approving nod from the medical profession; (2) the experience of each of the authors with this procedure was too limited to present an authoritative discussion as a solitary presentation; (3) reports of insufficiently discriminate use resulting in unjustified disrepute of the operation have been only too frequently encountered; and (4) sufficient time for postoperative evaluation has elapsed to allow analysis of the material at hand.

After approval by the committee regarding the topic for discussion, each member was sent a list of certain aspects of the question requesting detailed comment. The members were also requested to submit tabulated results of their experiences. Following receipt of this material this presentation was compiled, utilizing comments and suggestions from the committee.

Indications for Decortication in Pulmonary Tuberculosis

1. *What types of situations in pulmonary tuberculosis require consideration of decortication procedures?*

The number of instances requiring consideration is rather extensive and further syndromes requiring its contemplation will probably occur as greater experience with the procedure is provided. The indications for such consideration are shown in Chart I.

CHART I

INDICATIONS FOR CONSIDERATION OF DECORTICATION

I. Unexpanded lung following therapeutic pneumothorax.
II. Unexpanded lung following spontaneous pneumothorax with or without persistent fistula.
III. Fibrothorax with or without pneumothorax.
IV. Empyema, either tuberculous (simple) or mixed.
V. Fibrothorax or peel over an upper lobe preventing satisfactory thoracoplasty.
VI. Constricting peel over a healthy lobe (usually lower or middle) in association with a diseased lobe (usually upper), which latter lobe requires resection or permanent collapse.
VII. Bilateral disease presenting unilateral unexpandable lung or fibrothorax which precludes desired collapse or operative therapy on the contralateral side.

2. *What data are desired for preoperative evaluation?*

The committee feels that the following tabulation constitutes the basic data necessary for proper evaluation of candidates for this procedure:

CHART II
REQUIRED PREOPERATIVE DATA

I. *History:*
- Duration of disease
- Temperature course
- Cough: type and production
- Wheeze: localization if present
- Hemoptysis
- Type of disease
- History of spreads
- Behavior of each lung throughout disease process
- Sputum studies before and during treatment

II. *Course of Events Throughout Period of Collapse Therapy:*
- Duration of collapse
- Type of collapse obtained
- Evidence of lobar or pulmonary atelectasis, opaque type
- Complications
- Symptoms requiring continued pneumothorax refills
- Behavior of mediastinum, collapsed lung, and pleural space on attempts at spontaneous reexpansion

III. *Physical Examination:*

IV. *X-ray Data:*
- Pre-collapse films (These are of utmost importance)
- X-ray studies during period of attempted spontaneous reexpansion
- Fluoroscopy

V. *Laboratory Data:*
- Smear and cultural studies of sputum, and of pleural fluid, (if present)
- Cultural studies of gastric washings
- Streptomycin sensitivity studies

VI. *Special Studies:*
- Bronchoscopy
- Pre- and postoperative pulmonary function studies (if obtainable)

There appeared some variance of opinion by members of the committee in regard to required preoperative data as a whole. There was marked uniformity of opinion, however, and strong emphasis by all members on the importance of study of x-ray films of the chest prior to the institution of collapse therapy. As the discussion progresses, the importance of this factor will be increasingly emphasized. The surgeon must know the type and character of the disease process for which collapse therapy was instituted. Areas of major disease involving a single lobe or segments thereof usually need to be left under a protective constricting peel or need associated resection. Indiscriminate stripping of the constricting peel is reprehensible, and intelligent operative procedure is difficult, if not impossible, without available pre-collapse roentgen studies. When such films are not available then more detailed studies are required, inclusive of laminagraphy and frequently bronchography.

The committee feels that posterior anterior x-ray studies during inspiration and expiration can be helpful but are not mandatory, in that the information so obtained can be equally well discovered during fluoroscopy after sufficient eye accommodation; hence such x-ray studies are suggested only when expense is not a factor or where some unusual situation arises. Fluoroscopic examination should allow the physician to observe: (a) the mobility of the lung underlying the peel; (b) areas of contraction and of local emphysema in patients with thin overlying peel; (c) the degree of mediastinal shift during the phases of respiration; and (d) the functional status of the diaphragm.

The value of routine laminagraphy in evaluation of these patients was afforded different emphasis by individual members of the committee. The difficulty of interpreting such studies of the unexpandable lung is pointed out by Shaw and Paulson. Waterman states, "Laminagrams should be done selectively. Practically, because of expense, laminagrams probably can be omitted if the sputum has been consistently negative. If laminagrams are done, I would suggest the posterior anterior studies first, with lateral laminagraphy later if the findings should prove equivocal." Kay remarks as follows, "In all questionable cases, preoperative laminagrams are obtained, not only upon the side requiring decortication but frequently of the opposite side as well, in an attempt to locate any hidden lesions." The chairman feels that laminagrams become a routine whenever the pre-collapse x-ray studies are not available. He also feels that whenever such films can be taken without additional expense to the patient, they should be used routinely to determine from experience the actual value of the procedure in candidates for pulmonary decortication. The value of lateral laminagraphy in outlining the pulmonary circulation is becoming increasingly evident—this factor should be correlated into this patient group.

The committee uniformly believes that bronchography is applicable only to selected cases. Kay stresses the possibility of incorrect interpretation because the bronchi in the underlying contracted lung are invariably shortened and widened, lending to an incorrect diagnosis of minimal cylindrical bronchiectasis. Waterman recommends its use in patients having appreciable original disease. Shaw and Paulson consider a bronchogram necessary "if the underlying lung cannot be seen, either because of complete collapse or because of the thickness of the pleural scar." The chairman feels it must be considered whenever the pre-collapse film studies are not available. All members of the committee recommend its use when bronchiectatic symptoms are present. A deterrent, however, is the confusion residual oil pro-

duces in interpretation of subsequent x-ray studies on tuberculous patients.

In regard to pulmonary function studies, the committee considers them desirable in all patients when possible. In the main this is suggested in order to obtain more adequate data in this regard. It is rarely a requirement in evaluating the candidacy of patients for pulmonary decortication. This topic will be considered further under a separate section of this presentation.

3. *What effect does pulmonary decortication have upon pulmonary function?*

The early studies of Wright upon pulmonary function following decortication procedures upon the unexpandable lung in tuberculosis played a considerable role in dampening the enthusiasm of medical phthisiologists for this procedure. The committee does not wish to stir up a hornet's nest in this regard, but does wish to point out that this reaction by our medical confreres does not appear justifiable. The need for further extensive investigation in this regard should be emphasized. Such studies must cover a long term period, as becomes increasingly evident when one reviews the individual case report submitted by Kay, included herein. We are certain the return of function will vary with the type of case treated. Furthermore, the methods of postoperative management can influence the degree of postoperative re-functionalization. This was stressed by the editor in the discussion following Dr. Wright's original presentation before this Society. Furthermore, the technical aspect in regard to management of the parietal peel may well influence the functional result. Certainly it is hoped that investigation will be forthcoming which will compare the ultimate functional response of the decorticated lung where the parietal peel is excised, with cases of comparable disease where such peel is allowed to remain.

The surgical confreres tend to respond to the overall question by emphasizing the secondary status of the pulmonary function factor, in relation to the more important space obliteration resulting. While this is the response obtained from the majority of the committee, the chairman suspects that when more favorable data, such as that of Kay, herein included, and the unpublished data of Gaensler are allowed to accumulate, there will be equal emphasis placed upon the importance of space-filling and upon the restoration of pulmonary function.

The following abstract case report was submitted by Kay. It is hoped that further such detailed studies may soon be available.

A white male, T.A.S., age 35 years, gave the following history upon admission to Crile Veterans Administration Hospital. Diabetes mellitus was

discovered in 1943 while on duty in the Fiji Islands. During hospitalization for this, asymptomatic pulmonary tuberculosis was discovered on routine x-ray film examination. Positive sputum examination for M. tuberculosis was obtained following transfer to Kennedy General Hospital. Disease appeared arrested following initial period of bed rest, but underwent re-activation in December, 1947. Pneumoperitoneum and right phrenemphraxis proved unsatisfactory. In October 1948 right pneumothorax was instituted followed by pneumonolysis one month later. In April 1949 he was admitted to Crile Hospital. *Physical Examination* revealed hyperresonance over entire right chest. Left lung was clear to percussion and auscultation. *Fluoroscopy* revealed approximately 30 per cent collapse of the right lung. The upper lobe was well collapsed and there was considerable density in this lobe. There was probably an area of decreased density in the center of the collapsed right upper lobe. The diaphragmatic excursions were decreased bilaterally. *Laboratory Data:* All specimens positive for M. tuberculosis. Streptomycin sensitivity to 3 mg. *X-ray Films:* There was a density involving the major portion of the right upper lobe and the left apical region. Impression: Bilateral pulmonary inflammatory lesion, presumably tuberculosis, with pneumothorax on the right.

Bronchoscopy: Negative.

Progress in Hospital: The right pneumothorax was maintained until August 12, 1949. Diabetes mellitus was kept under fair control. Streptomycin 1 gm. daily was given from May 23, 1949 for six weeks. Sputum remained persistently positive and the right upper lobe cavity failed to close.

On August 12, 1949 it was recommended that reexpansion of the right lung should be accomplished, and the case presented at surgical conference. At surgical conference September 12, 1949, it was recommended that a decortication procedure be done, and then if the lobes could be easily separated, a right upper lobe resection performed. If this should not be possible, the patient should have a decortication and right upper thoracoplasty. The following respiratory function studies were carried out:

Bronchospirometry, November 15, 1949: A Gebauer catheter was passed and positioned under fluoroscopic observation. Anaesthesia was excellent and patient gave complete cooperation. Analysis of the record revealed:

	Left Lung Per cent	Right Lung Per cent
Minute Volume Ventilation	63	37
Vital Capacity	76	24
Oxygen Consumption	80	20
Ventilation Equivalent	28.3 L.	67.5 L.

Respiratory Pattern—*Left Lung:* Normal.
Right Lung: Normal except for definite restriction to maximal inspiration.

Pulmonary decortication and right upper lobectomy were done on November 23, 1949. Two weeks following this procedure and one week before thoracoplasty, further studies were carried out.

Bronchospirometry, December 6, 1949:

	Left Lung Per cent	Right Lung Per cent
Minute Volume Ventilation	51	49
Vital Capacity	64	36
Oxygen Consumption	85	15
Ventilation Equivalent	12.2 L.	66.0 L.
Respiratory Pattern—Not remarkable except for the fact that the increase in vital capacity on the right side was due entirely to an increase in reserve air, the complemental air and the ability for maximal expansion being still very deficient.		

Thoracoplasty was performed on December 13, 1949. After a five-month period following thoracoplasty, the bronchospirometric studies were again repeated, with results as follows:

	Left Lung Per cent	Right Lung Per cent
Minute Volume Ventilation	58	42
Vital Capacity	58	42
Oxygen Consumption	58	42
Ventilation Equivalent	18.7 L.	18.6 L.
Respiratory Pattern—*Both lungs:* Normal.		

Comment

When compared with the prethoracoplasty recording obtained on December 6, 1949, it is evident that thoracoplasty has led to some reduction in ventilation on the right side. The striking finding, however, is the excellent oxygen uptake and normal mechanics on the right in contrast to the severe deficiency in these functions which was observed on December 6, 1949. There is no basis for questioning either recording on a technical basis. Furthermore progressive improvement in oximetry tests had also indicated marked improvement in efficiency of gas absorption. It therefore appears that in this case decortication has resulted in an excellent restoration of right lung function although a significant period of time was required postoperatively for this function to return.

R. S. Alexander, Ph.D.

Certainly such findings show that remarkable return of pulmonary function may be obtained, and that further studies should be carried out especially after a sufficient time period has elapsed following surgery. Again the committee wishes to stress that decortication in pulmonary tuberculosis is not a procedure simply

for restoration of pulmonary function. It is fundamentally a procedure aimed at preservation of the future pulmonary health of the patient. As such, it aims toward: (1) maintenance of proper central positioning of the mediastinum to prevent (a) over-distention of the contralateral lung, (b) distortion and resulting functional disturbance of the trachea, (c) disturbance of function of the heart and great vessels; (2) obliteration of a hazardous dead space which predisposes towards subsequent simple or mixed empyema; (3) facilitation of proper collapse therapy or extirpation of uncontrolled foci of tuberculous infection; and (4) restoration of function of unnecessarily constricted healthy pulmonary tissues.

Certain Specific Problems Relative to Decortication

A questionnaire was submitted to each member of the committee. These individual questions with the resultant opinions expressed will now be presented.

I. *How long should one try to obtain spontaneous reexpansion of a lung following discontinuance of therapeutic pneumothorax?*

As soon as he decides to discontinue therapeutic pneumothorax, the physician should take cognizance of: (a) the thickness of the visceral pleural scar; (b) the extent of the original disease; (c) the patency of the airway; (d) the character of the fluid in the pleural space; (e) the position of the upper and lower mediastinal structures; and (f) the behavior of the intrapleural pressures. The committee predicates that any purposeless pleural space should be obliterated quickly, even if a decortication is necessary to accomplish this. The possible need of decortication then must be considered as soon as the decision is made to abandon the therapeutic pneumothorax. The period of trial of spontaneous reexpansion does not appear to be a cut and dried situation, but must vary with the individual patient. Certainly decortication is immediately indicated when a patient presents a situation wherein further conservative therapy will be expected to fail. Therefore, reexpansion is allowed to occur spontaneously for as long as such reexpansion is progressive. When further expansion fails to take place, there is no reason for further delay. Usually a period of three to four months allows sufficient time for such determination. If a persistent fistula is present over a period of six to eight weeks, no further observation is required. If, during the first month or six weeks of trial of spontaneous reexpansion, one notes either: (1) marked mediastinal shift, (2) excessive fluid formation, or (3) persistent discomfort requiring pneumothorax refills, the indications for early surgical intervention are present.

II. *How much of the lung should be decorticated?*

The committee believes strongly in selective decortication, that is, in not decorticating those areas overlying major disease. Again, a study of the original pre-collapse x-ray films is essential. Frequently the peel is unusually adherent over areas of appreciable disease which would be best left unexpanded. Rather than risk over-expansion of the remaining (that is, non-infected) pulmonary tissue, thoracoplasty should be considered following decortication in a good number of instances. In cases where the original disease was minimal and has been well arrested, most of the involved lobe should be decorticated but the area of major segmental disease left untouched. In patients having previous moderately advanced disease, the author and some of the committee felt that decortication of the disease site should not be performed, but resection or thoracoplasty carried out. In patients having positive sputum thought to be caused by such areas, lobectomy or segmental resection would always seem preferable. Shaw and Paulson state, "As a rule, if the original disease was relatively minimal, we see no reason for not expanding the entire involved lobe if it has been collapsed long enough to insure healing. If the disease was more than moderately advanced, we would probably do a resection at the time of decortication, unless the lobe has been collapsed for many years, the sputum negative, and the lobe satisfactory appearing upon reexpansion."

III. *If an unexpandable lung originally showed cavitary disease, should the cavity bearing area be reexpanded? If so, what limits would you place on cavity size?*

The answer to this question revealed some controversial opinion, already partially covered in the preceding discussion. Little controversy arose regarding cavity size, however, in that cavity size depends upon such things as tension and may not be directly related to tissue destruction. Paulson and Shaw, and Waterman expressed willingness to reexpand such lobes if sufficient time had previously elapsed to insure healing. The remainder of the committee felt that areas of cavitary disease should not be fully reexpanded. The chairman feels that a study of supposedly "healed" cavities under thoracoplasty as determined from resection or autopsy findings, makes one wonder when, if ever, one can classify a cavity as "healed" under collapse therapy.

IV. *What effect would the character of the peel have on your recommendation for surgery? How thick can the visceral and/or the parietal peel be and a satisfactory result still be obtained?*

The consensus of opinion is that the thickness of the peel may increase the technical difficulties of the procedure. It is not con-

sidered to play any major role in the ultimate result which one may expect. In fact, the thicker the peel the more definite is the requirement for decortication. In empyema, however, the peel is almost invariably more adherent.

V. *What is the importance of the presence or the character of pleural fluid?*

The presence of fluid is not important, per se. One usually expects fluid when confronted with highly negative intrapleural pressures. Thick fluid may be indicative of empyema, and if this is seriously suspected, the entire sac is preferably excised in one piece without the chance of contamination of the space.

VI. *What are the important technical aspects in the operation of decortication for pulmonary tuberculosis?*

The committee stresses the desirability of complete removal of the visceral and parietal peel, if possible in one or two pieces. The lung must be completely released by adequate mobilization of the lung within the fissure and about the entire hilum. Possible active foci of pulmonary disease encountered of course require consideration of resection or subsequent permanent collapse therapy. After the original peel is removed, there is occasionally failure of good reexpansion. In such patients careful examination will often reveal a very thin constricting membrane on the lung surface and under the previous peel. The peel, therefore, may be multi-layered. The lung beneath usually shows marked infolding. Such a condition should be carefully looked for and corrected. The diaphragm should be carefully freed of peel and mobilized to the insertion. Care should be exercised to avoid injury to the phrenic nerve. In stripping the parietal peel, care should be exercised to avoid unnecessary damage to the underlying veins, arteries, and nerves. Adequate drainage tubes must be used to allow early and complete reexpansion of the lung. The lung should be relatively airtight at the time of completion of the intrapleural portion of the operation.

VII. *What are the important factors in the postoperative care of these patients?*

Primarily, adequate drainage of the pleural space must be obtained. Some of the committee routinely use negative pressure suction on the thoracotomy drainage tubes, others underwater seal. Clear patency of the tracheo-bronchial airway must be maintained at all times, and postoperative bronchoscopy is recommended almost routinely. Breathing exercises aimed towards refunctionalization of the chest wall are of basic importance, and

must be instituted early in the postoperative period and continued for several weeks or months. Chemotherapy, particularly penicillin and streptomycin, are important adjuncts. Early ambulation is the rule.

VIII. *What influence does a paralyzed diaphragm play in the success of the procedure?*

A paralized diaphragm decreases the efficiency of the cough reflex, and often brings about a less satisfactory end result in regard to pulmonary function. It also apparently decreases the ease of reexpansion of the lung. However, it does not contraindicate the procedure. If such a paralysis is of recent origin, one should delay the operation of decortication a reasonable period in the hope diaphragmatic function will return.

IX. *Should the parietal peel be removed in noninfected cases?*

All members of the committee feel the parietal peel should ideally be removed in all cases, although in some instances where the peel is thin this may not be mandatory. Comparative functional studies might well be carried out in this regard, as previously stated. The chairman feels, from his own experience, that remarkable thickness of parietal peel occasionally can undergo resolution by chest exercises. He insists on two months of chest exercises before decortication in any elective operation for decortication. Waterman also feels preoperative education in this regard is highly beneficial.

X. *How long should negative sputum be present before decortication of an unexpandable lung is undertaken?*

This question is intended to apply only to patients in whom no resection or thoracoplasty is planned. Patients with predicted positive sputum at the time of operation would of course not fall into this group.

The committee members recommended no strict rule in this regard. The time suggested varied from one to three years. Distinct mention was made that the patient's initial response to pneumothorax could influence the time desired. Thus an immediate satisfactory conversion of sputum following institution of pneumothorax for a small cavity might hardly require more than one year of negative sputa prior to decortication. If there was a marked delay in sputum conversion, then more intensive preoperative investigation is required. In such patients associated measures such as resection or subsequent thoracoplasty may be necessary.

XI. *In cases of unexpandable lung coming to decortication, what should be the status of the contralateral lung?*

Ideally, the contralateral lung should be free of disease or completely quiescent. In some cases, however, reexpansion of one side may be considered in order to permit collapse therapy of active disease on the contralateral side.

XII. *What factor does duration of collapse play upon the ultimate success of the operation?*

One would expect that the longer the unexpandable lung has been collapsed, the less it would expand and the more probable a conjunctive thoracoplasty would be required. This was the presumption and opinion of one-half the committee. However, all members suggested that the type and extent of the underlying parenchymal disease prior to collapse are more important factors. Instances of successful procedures after nine (Waterman) and fourteen years (Kay) of collapse therapy were recorded. Seven of Waterman's cases were collapsed over five years, yet reexpanded satisfactorily.

XIII. *Should tuberculous empyema be decorticated if the organism is streptomycin resistant?*

The committee proved quite divided on this question. Paulson and Shaw, and Bailey did not consider this too hazardous if the pleural capsule could be removed completely. The others were averse to the procedure. The chairman experienced a fatal spread of disease in one patient under these circumstances, and does not recommend it unless the older methods of handling such cases have been given adequate trial.

XIV. *What is the importance of a markedly decreased oxygen consumption in the unexpandable lung? Does it mitigate against operation?*

The committee feels that such a finding only increases the need for the operation unless pre-collapse x-ray studies indicate a diffuse involvement of the collapsed lung. In such cases, thoracoplasty alone might be the preferable procedure.

XV. *What are the experiences and results of the committee members to date with this operative procedure?*

The aggregate number of patients subjected to this operation is not large. The members of the committee wish to record 66 patients undergoing this operation. The type of procedures and the clinical results are as follows:

CHART III

Composite Experience with Decortication in Pulmonary Tuberculosis

Type of Procedure	Number of Cases	— — RESULTS — — Good	Fair	Poor	Deaths
I. *Unexpandable lung:*					
a. Simple decortication	35	33	0	2	0
b. Decortication plus resection	13	12	1	0	0
c. Decortication plus thoracoplasty	3	3	0	0	0
II. *Tuberculous empyema.*					
a. Simple decortication	3	2	1	0	0
b. Decortication plus resection	2	2	0	0	0
c. Decortication under thoracoplasty with resection	3	2	0	0	1
III. *Mixed empyema:*					
a. Simple decortication	7	2	0	2	3
TOTALS	66	56	2	4	4

A study of these results would indicate that a favorable result can be predicted in all categories save that of mixed tuberculous empyema. It is felt that one must employ most careful selection of cases in this last category, and rarely if ever elect the procedure in patients having mixed tuberculous empyema containing streptomycin resistant organisms.

SUMMARY AND CONCLUSIONS

This article constitutes the first in what is hoped will be a series of annual contributions by the Sub-Committee on Surgical Treatment of Diseases of the Chest upon a controversial or newer aspect of thoracic surgery. The chairman wishes to express his appreciation for the sincere helpfulness and cooperation of the participating members.

The present status of our thought upon various aspects relative to decortication procedures in pulmonary tuberculosis is presented. The indications for the procedure are multiple and have been enumerated. The data necessary for preoperative evaluation are also listed. Of major importance in this regard is the examination of the pre-collapse x-ray films of the chest. Bronchoscopy is considered a necessary factor in the evaluation of most of the candidates for the procedure. Bronchography is occasionally indicated. Laminagrams are only required under special circumstances. Pulmonary function studies are desirable in all future cases for better evaluation of functional results.

One case report is included suggesting that major improvement in oxygen consumption by the decorticated lung may be obtained.

The operation of pulmonary decortication has several aims other than improvement in pulmonary function. These are enumerated in the text. Certain specific questions relative to evaluation of patients, methods of preoperative observation, technical aspects of the operation, and methods of postoperative management are discussed.

1) The operation of decortication in pulmonary tuberculosis is a valuable procedure.
2) It is a dangerous operation in the presence of tuberculous empyema, particularly mixed infections, wherein the offending tuberculosis organisms are streptomycin resistant.
3) Pulmonary decortication can result in valuable restoration of pulmonary function.
4) Areas of serious major tuberculous disease should not be decorticated, but should be treated by concommitant resection or subsequent thoracoplasty. Selective decortication is the procedure of choice in cases of less extensive disease.
5) Cavity bearing areas should not be allowed to reexpand fully.
6) The thickness and character of the peel does not necessarily influence the result to be expected from operation.
7) The presence of pleural fluid is not considered important unless true empyema is present. In empyema, intact excision of the pleural capsule is recommended.
8) Important technical factors in the operation are removal of both parietal and visceral peels, mobilization of the diaphragm, correction of infolding of the lung, and avoidance of damage to the phrenic nerve and other subpleural structures.
9) Adequate drainage, a clear airway, chemotherapy, and early rehabilitation chest exercises are the important postoperative factors influencing a successful result.
10) A paralyzed diaphragm hinders the efficiency of the operation.
11) The parietal peel should be excised in all patients.
12) The sputum tests should be negative for a minimum of one year prior to surgery in the average case of simple decortication, though a longer period is usually preferable.
13) The status of disease in the contralateral lung may vary with the needs and indications for decortication.
14) The type and extent of the underlying parenchymal disease prior to collapse are more important factors than duration of collapse. Successful procedures after nine and 14 years of collapse are recorded.
15) Experience with 66 operative cases indicate that the procedure proved to be extremely valuable in 56 instances.

Discussion by David H. Waterman, M.D., F.C.C.P., Knoxville, Tennessee: I would like to emphasize three points: first, that cases well selected for pneumothorax in the first place are well selected for decortication; second, that reactivation following decortication is not wholly the failure of the operation itself, but rather of the selection of the case for pneumothorax; and third, that decortication enhances the value of pneumothorax therapy in that it increases the number of favorable final results obtained.

Our own experience continues to be favorable, and has encouraged us to further extend the application of the procedure.

ERRATUM

On page 441 of the April 1952 issue in the article entitled "Determination of Blood Plasma Levels of Hydrazine Derivatives of Isonicotinic Acid," by Saul H. Rubin, Ph.D., Leon Drekter, Jacob Scheiner, M.S. and Elmer De Ritter, B.S., there appeared an equation as follows:

$$\frac{\text{mg. of Rimifon or Marsilid}}{\text{100 ml. of plasma}} = \frac{A}{S \times F}$$

This equation should read:

$$\frac{\text{100 ml. of plasma}}{\text{mg. of Rimifon or Marsilid}} = \frac{A}{0.75 \times S \times F}$$

EXECUTIVE SECRETARY ATTENDS CONFERENCES

Mr. Murray Kornfeld, Executive Secretary of the American College of Chest Physicians, met with the Governors, Regents and Chapter officials of the College in Philadelphia, March 27, New York City, March 31, and Boston, April 2. The College program was reviewed at these conferences and plans for the expansion of College activities were discussed. Mr. Kornfeld also attended the Fifth Annual Postgraduate Course of the College held at the Warmick Hotel, Philadelphia, March 24-28, and the Annual Meeting of the American Academy of General Practice, Atlantic City.

ONE THOUSAND DOLLAR CONTRIBUTION TO COUNCIL ON RESEARCH FUND

The New Jersey Chapter voted to contribute to the Council on Research Fund of the College $1,000 to help meet the quota assigned to New Jersey. These funds were derived from the Postgraduate Course sponsored by the Chapter in conjunction with the New Jersey Academy of General Practice. Eighty-five physicians attended this course, which was given on four consecutive Wednesdays during February and March.

Eighteenth Annual Meeting

American College of Chest Physicians

Congress Hotel, Chicago, Illinois

JUNE 5 - 8, 1952

PROGRAM

Thursday, June Fifth

Annual Meeting—*Board of Regents*

Annual Meeting—*Board of Governors*

Annual Meetings—*Councils and Committees*

Oral and Written Examinations for Fellowship

12:00 Noon—Luncheon

Annual Conference of College Chapter Officials,
William A. Hudson, Detroit, Michigan, Chairman
Alfred Goldman, Beverly Hills, California, Secretary.

Awarding of Certificates of Merit to Past Presidents of College Chapters,
Chevalier L. Jackson, Philadelphia, Pennsylvania, President.

4:00 p.m.—*Council of Tuberculosis Hospitals,*
Russell S. Anderson, Erie, Pennsylvania, Chairman.

Report—*Committee on Chest Diseases in Institutions,*
Otto L. Bettag, Chicago, Illinois, Chairman.

Report—*Committee on Hospital Statistics,*
Loren L. Collins, Edwardsville, Illinois, Chairman.

Report—*Committee on Rehabilitation,*
Allan Hurst, Denver, Colorado.

Discussion on Hospital Standards and Accreditation,
I. D. Bobrowitz, Otisville, New York.

8:00 p.m.—GENERAL SCIENTIFIC SESSION

Opening Remarks: Harold G. Trimble, Oakland, California,
Chairman, Committee on Scientific Program.

Chevalier L. Jackson, Philadelphia, Pennsylvania, Chairman.

"Diagnosis of Cardiospasm,"
Arthur M. Olsen and Colin B. Holman, Rochester, Minnesota.

"Artificial Pneumoperitoneum in the Treatment of Pulmonary Tuberculosis: A Critical Review,"
Francisco J. Menendez, Havana, Cuba.

"Stress Reaction in Pulmonary Tuberculosis,"
Alfred Goldman, Alfred Breckler and Eric Stern,
Los Angeles, California.

"The Usefulness of the Hotchkiss-McManus Stain for the Diagnosis of the Deep Mycoses,"
John H. Seabury, J. Winthrop Peabody Jr., and M. Jack Liberman,
New Orleans, Louisiana.

"Relationship of the Incidence of Emboli in Acute Coronary Artery Occlusion to Treatment,"
R. W. Kissane, R. S. Fidler, James J. Conn and Robert W. Sohl,
Columbus, Ohio.

"Comparative Therapeutic and Toxicologic Properties of Isonicotinic Acid Hydrazide (Rimifon) and Its Isopropyl Derivative (Marsilid),"
Edward H. Robitzek and Irving J. Selikoff, Staten Island, New York.

Friday, June Sixth

9:00 a.m.—*Scientific Session*

CLINICAL APPLICATIONS OF PULMONARY FUNCTION STUDIES

Maurice S. Segal, Boston, Massachusetts, Chairman.

"Some Problems of Bronchospirometry: Analysis of 1,000 Procedures,"
Edward A. Gaensler, Boston, Massachusetts.

"The Use of Pulmonary Function Tests for Disability Appraisal: Including Evaluation Standards in Chronic Pulmonary Disease,"
Hurley L. Motley, Philadelphia, Pennsylvania.

Discussor: George W. Wright, Saranac Lake, New York.

"Pulmonary Function and Circulatory Dynamics in Artificial Pneumoperitoneum,"
Rose C. Kory, Dan C. Roehm, George R. Meneely and Robert A. Goodwin, Nashville, Tennessee.

Discussor: Hurley L. Motley, Philadelphia, Pennsylvania.

"Differentiation of Pulmonary Fibrosis and Pulmonary Emphysema by Physiologic Standards,"
George W. Wright, Saranac Lake, New York.

Discussors: Edward A. Gaensler, Boston, Massachusetts,
George R. Meneely, Nashville, Tennessee.

Panel Discussion: Maurice S. Segal, Chairman

Edward A. Gaensler	George G. Ornstein
George R. Meneely	Frank Princi
Hurley L. Motley	George W. Wright

12 Noon—*Round Table Discussions*

A-1 "Excisional Surgery in Minimal Tuberculosis,"
Howard T. Barkley, Houston, Texas; G. A. Hedberg, Nopeming, Minnesota; Henry C. Sweany, Tampa, Florida.

Moderator: Otto L. Bettag, Chicago, Illinois.

A-2 "Diagnosis and Management of Cor Pulmonale,"
Hans H. Hecht, Salt Lake City, Utah; Aldo A. Luisada, Chicago, Illinois; Chauncey C. Maher, Chicago, Illinois.

Moderator: Edgar M. Stevenson, Bloomington, Illinois.

A-3 "Pneumoperitoneum,"
James S. Edlin, New York, New York; Ephraim Korol, Spivak, Colorado; Harold M. Van Der Schouw, Wheatridge, Colorado.

Moderator: Joseph C. Placak, Cleveland, Ohio.

A-4 "Asthma,"
Allan Hurst, Denver, Colorado; Arthur M. Olsen, Rochester, Minnesota; Maurice S. Segal, Boston, Massachusetts.

Moderator: Paul K. Bornstein, Asbury Park, New Jersey.

A-5 Coronary Disease and Myocardial Infarction,"
Arlie R. Barnes, Rochester, Minnesota; Ray W. Kissane, Columbus, Ohio; H. Easton McMahon, New York, New York.

Moderator: Nathaniel Reich, Brooklyn, New York.

A-6 "Suppurative Diseases and Bronchiectasis,"
H. J. Moersch, Rochester, Minnesota; Arthur S. Touroff, New York, New York; David H. Waterman, Knoxville, Tennessee.

Moderator: Harold W. Kohl, Tucson, Arizona.

2:00 p.m.—*Scientific Session*

CARDIOVASCULAR DISEASES

Charles P. Bailey, Philadelphia, Pennsylvania, Chairman
Nathaniel E. Reich, Brooklyn, New York, Co-Chairman

"The Surgical Treatment of Cyanotic Heart Disease,"
Willis J. Potts, Chicago, Illinois.

"The Differentiation of Cardiac and Pulmonary Lesions by Angiocardiography,"
Charles T. Dotter and Israel Steinberg, New York, New York.

"Newer Methods of Diagnosis of Coronary Disease,"
Myron Prinzmetal, Los Angeles, California.

"Diagnosis in Congenital Heart Disease,"
Daniel S. Downing, Philadelphia, Pennsylvania.

"Revascularization of the Heart,"
Claude S. Beck, Cleveland, Ohio.

Panel Discussion.

8:00 p.m.—*Motion Picture Session on Diseases of the Chest,*
Paul H. Holinger, Chicago, Illinois, Chairman.

Saturday, June Seventh

9:00 a.m.—*Administrative Session—Election of Officers*
Chevalier L. Jackson, Philadelphia, Pa., President, presiding.

Report on Hydrazine Derivatives of Isonicotinic Acid,
Committee on Chemotherapy and Antibiotics.

10:00 a.m.—*Scientific Session*

OCCUPATIONAL DISEASES OF THE CHEST

A series of short presentations on topics of current interest in the field, followed by a Panel Discussion with questions from the floor.

O. A. Sander, Milwaukee, Wisconsin, Chairman
Louis L. Friedman, Birmingham, Alabama, Co-Chairman
Arthur J. Vorwald, Saranac Lake, New York, Co-Chairman.

12:00 Noon—*Round Table Discussions*

B-1 "ACTH and Cortisone in Chest Disease,"
Smith Freeman, Chicago, Illinois;
Laurance W. Kinsell, Oakland, California.

Moderator: Seymour M. Farber, San Francisco, California.

B-2 "How Should Pregnancy in the Chest Disease Patient be Handled?"
John F. Briggs, St. Paul, Minnesota; M. F. Guzman, Huntingburg, Indiana; Henry W. Leetch, Saranac Lake, New York;
C. Gerald Scarborough, San Jose, California.

Moderator: Jules M. Davidson, New Orleans, Louisiana.

B-3 "Surgical Excision in Empyema,"
L. Chandler Roettig, Columbus, Ohio; Irving A. Sarot, New York, New York; Carl O. Schaefer, Racine, Wisconsin.

Moderator: Louis Mark, Columbus, Ohio.

B-4 "Management of Cough,"
Andrew L. Banyai, Milwaukee, Wisconsin;
Benson Bloom, Tucson, Arizona.

Moderator: J. Winthrop Peabody, Washington, D. C.

B-5 "Chemotherapy in Tuberculosis,"
Sumner S. Cohen, Oak Terrace, Minnesota; Alfred Goldman, St. Louis, Missouri; Edward H. Robitzek, Staten Island, New York; Carl W. Tempel, Denver, Colorado; William B. Tucker, Minneapolis, Minnesota.

Moderator: Karl H. Pfuetze, Chicago, Illinois.

B-6 "Surgery in Acquired Heart Disease,"
Charles P. Bailey, Philadelphia, Pennsylvania; Ivan D. Baronofsky, Minneapolis, Minn.; Claude S. Beck, Cleveland, Ohio.

Moderator: William R. Rumel, Salt Lake City, Utah.

2:00 p.m.—*Scientific Session*

CARCINOMA OF THE LUNG

Andrew L. Banyai, Milwaukee, Wisconsin, Chairman

"Environment and Cancer of the Lung,"
Stelio Imprescia, Louisville, Kentucky.

"Causes of Death in Carcinoma of the Lung in a Large Public Hospital,"
Frederick F. Boyce, New Orleans, Louisiana.

"Nonsurgical Treatment of Primary Cancer of the Lung,"
Edgar Mayer and Bernard Roswit, New York, New York.

Discussor: Seymour M. Farber, San Francisco, California.

3:00 p.m.—*Scientific Session*

"The Reliability of Chest Roentgenography and Its Clinical Implications,"
Jacob Yerushalmy, Berkeley, California.

3:30 p.m.—*X-Ray Symposium*
Leo G. Rigler, Minneapolis, Minnesota, Chairman.

6:00 p.m.—*Annual Convocation*
Chevalier L. Jackson, Philadelphia, Pa., President, presiding.

Report of the College Historian,
Carl C. Aven, Atlanta, Georgia.

Awarding of Fellowship Certificates,
James H. Stygall, Indianapolis, Indiana,
Chairman, Board of Regents.

7:00 p.m.—*Cocktail Party*

7:30 p.m.—*Annual Presidents' Banquet*
Chevalier L. Jackson, Philadelphia, Pa., President, presiding.

Introduction of Guests.

Introduction of President-Elect,
Andrew L. Banyai, Milwaukee, Wisconsin.

Presentation of College Medal.

Presentation of College Essay Award.

Sunday, June Eighth

9:00 a.m.—*Scientific Session*

MEDICAL MANAGEMENT OF DISEASES OF THE CHEST

W. L. Howard, Northville, Michigan, Chairman.

"Bed Rest,"
William M. Peck, McCain, North Carolina.

"Antimicrobial Therapy of Pulmonary Tuberculosis,"
William B. Tucker, Minneapolis, Minnesota.

"Long Term Streptomycin Therapy Program Without Collapse,"
Nicholas D. D'Esopo, Sunmount, New York.

"The Place of Pneumoperitoneum in the Nonsurgical Treatment of Pulmonary Tuberculosis,"
William Schwartz, Oteen, North Carolina.

"The Place of Pneumothorax in the Treatment of Pulmonary Tuberculosis,"
Roger S. Mitchell, Trudeau, New York.

"The Place of Phrenic Paralysis in the Treatment of Pulmonary Tuberculosis,"
Winthrop Davey, Ann Arbor, Michigan.

Panel Discussion: W. L. Howard, Chairman

Nicholas D. D'Esopo	William Schwartz
Roger S. Mitchell	Carl W. Tempel
William M. Peck	William B. Tucker

Buford H. Wardrip

12:00 Noon—*Round Table Discussions*

C-1 "New Developments in the Management of Tuberculosis in Children,"
Milton I. Levine, New York, New York; Eugene T. McEnery, Chicago, Illinois; Bret Ratner, New York, New York.
Moderator: Leon H. Collins, Philadelphia, Pennsylvania.

C-2 "Emphysema,"
Alvan L. Barach, New York, New York; Burgess L. Gordon, Philadelphia, Pennsylvania; George G. Ornstein, New York, N. Y.
Moderator: Alexander Libow, Miami Beach, Florida.

C-3 "Foreign Material in Surgical Collapse of the Lungs,"
William E. Adams, Chicago, Illinois; Otto C. Brantigan, Baltimore, Maryland; Alfred Goldman, Beverly Hills, California; John B. Grow, Denver, Colorado.
Moderator: Duane Carr, Memphis, Tennessee.

C-4 "Rehabilitation of the Cardiac Patient,"
Arthur M. Master, New York, New York; Hugh McCulloch, Chicago, Illinois; John J. Sampson, San Francisco, California.
Moderator: Milton W. Anderson, Rochester, Minnesota.

C-5 "Congenital Heart Disease,"
Osler A. Abbott, Emory University, Georgia; Benjamin M. Gasul, Chicago, Illinois; Morse J. Shapiro, Beverly Hills, California.
Moderator: Edgar W. Davis, Washington, D. C.

C-6 "Diagnosis and Management of Bronchopulmonary Mycotic Infections,"
Michael J. Furcolow, Kansas City, Kansas; Alvis E. Greer, Houston, Texas; N. S. Plummer, London, England; John H. Seabury, New Orleans, Louisiana.
Moderator: Louis I. Sokol, Los Angeles, California.

2:00 p.m.—*Scientific Session*

SURGICAL MANAGEMENT OF DISEASES OF THE CHEST

Herbert C. Maier, New York, New York, Chairman.

"Segmental Resection in Tuberculosis,"
Richard H. Overholt, Francis M. Woods and Norman J. Wilson, Brookline, Massachusetts.

"Pulmonary Resection for Tuberculosis in Children and Adolescents,"
Morris Rubin, Bronx, New York.

"The Clinical Problem of Cystic Disease of the Lung,"
Richard H. Meade and Richard A. Rasmussen, Grand Rapids, Mich.

Panel Discussion: Herbert C. Maier, Chairman
Richard H. Meade
Richard H. Overholt
Morris Rubin.

4:00 p.m.—*Meeting, Board of Regents*

6:00 - 8:00 p.m.—*Open House, College Building*

Monday, June Ninth

12:00 Noon—*Luncheon Meeting*

Council on Undergraduate Medical Education,
Edward W. Hayes, Monrovia, California, Chairman, presiding.

6:30 p.m.—*Dinner Meeting*

Joint Committee on Chest X-Ray,
Leo G. Rigler, Minneapolis, Minnesota, Chairman,
American College of Radiology.
Otto L. Bettag, Chicago, Illinois, Chairman,
American College of Chest Physicians.

Clinics will be held at various hospitals in the Chicago area on Monday June 9.

LADIES ACTIVITIES

All ladies attending the meeting are invited to register and obtain guest badges. There is a special Registration Desk for the ladies.

FRIDAY, JUNE SIXTH

12:00 Noon—*Get-Acquainted Luncheon*

Arrangements to attend the luncheon may be made at the Ladies Registration Desk.

SATURDAY, JUNE SEVENTH

6:00 p.m.—*Annual Convocation*

7:00 p.m.—*Cocktail Party*

7:30 p.m.—*Annual Presidents' Banquet*

SUNDAY, JUNE EIGHTH

6:00 to 8:00 p.m.—*Open House, College Building*

Ladies Reception Committee.
Mrs. J. J. Mendelsohn, Chairman
Mrs. Otto L. Bettag, Co-Chairman.

SECTION ON DISEASES OF THE CHEST

American Medical Association

Room 9, Navy Pier

Officers of the Section:

Chairman, J. Winthrop Peabody, Washington, D. C.
Vice Chairman, Joseph C. Placak, Cleveland, Ohio
Secretary, Jay Arthur Myers, Minneapolis, Minnesota
Executive Committee, Walter E. Vest, Huntington, West Virginia;
Alvis E. Greer, Houston, Texas;
J. Winthrop Peabody, Washington, D. C.

TUESDAY, JUNE TENTH, 9:00 a.m.

Chairman's Address: "Present Trends in Diseases of the Chest,"
J. Winthrop Peabody, Washington, D. C.

"The Treatment of Bronchial Asthma,"
Leon Unger and Albert H. Unger, Chicago, Illinois.

"Pulmonary Complications of Cardiospasm,"
H. A. Andersen and C. B. Holman, Rochester, Minnesota.

"Present Status of Drugs in Treatment of Tuberculosis,"
Carl W. Tempel, Denver, Colorado.

"Treatment of Human Tuberculosis with Hydrazide of Isonicotinic Acid,"
Irving J. Selikoff, Paterson, New Jersey and
Edward H. Robitzek, Staten Island, New York.

"Water Soluble Contrast Media for Bronchoscopy,"
M. E. Flipse, Rochester, Minnesota;
G. A. Hedberg and Victor R. Krueger, Nopeming, Minnesota.

"Juxtacarina Biopsy in Evaluation of Operability of Bronchial Carcinoma,"
C. B. Rabin and Rudolph Kramer, New York, New York.

"The Wolff-Parkinson-White Syndrome,"
Eliot Corday, Beverly Hills, California; Rexford Kennamer,
John A. Osborne, Joshua Fields and L. Allen Smith, Los Angeles,
California; Myron Prinzmetal, Beverly Hills, California.

WEDNESDAY, JUNE ELEVENTH, 9:00 a.m.

Election of Officers

"Tuberculosis Control in Lincoln County, Minnesota,"
S. A. Slater, Worthington and A. L. Badheim, Tyler, Minnesota.

"Hidden or Unsuspected Bronchiectasis in the Asthmatic,"
Richard H. Overholt, J. H. Walker and
F. M. Woods, Brookline, Massachusetts.

"Polycythenia and Heart Failure in Chronic Lung Disease,"
Hans H. Hecht, Salt Lake City, Utah.

"The Diagnosis and Treatment of Patients Suffering from Simple Bronchial Erosion with Pulmonary Hemorrhage,"
Porter P. Vinson, Richmond, Virginia.

"Recent Trends in the Treatment of Pulmonary Tuberculosis,"
N. D. D'Esopo, Sunmount, New York.

"The Surgical Treatment of Aortic Stenosis,"
C. P. Bailey, H. P. Redondo and H. B. Larzelere,
Philadelphia, Pennsylvania.

"Clinical and Physiological Aspects of Mechanically Induced Cough,"
Alvan L. Barach, New York, New York.

"Intermittent Positive-Pressure Breathing in the Treatment of Chronic Pulmonary Diseases,"
Reginald H. Smart, Los Angeles; C. K. Davenport, Fontana; and G. W. Pearson, Los Angeles, California.

THURSDAY, JUNE TWELFTH, 9:00 a.m.

Joint Meeting with Section on Anesthesiology

Room 7, Navy Pier

"Chest Conditions of Mutual Concern to Chest Specialists and Anesthesiologists,"
James J. Waring, Denver, Colorado.

Discussors: Richard H. Overholt, Brookline, Massachusetts
Lloyd H. Mousel, Seattle, Washington.

"The Prevention of Postoperative Pulmonary Complications by a Program Dependent Entirely on the Anesthesiologist,"
Barnett A. Greene, Brooklyn, New York.

Discussors: Paul H. Holinger, Chicago, Illinois
Willis J. Potts, Chicago, Illinois.

"The Relationship of Pain Control to Pulmonary Surgery,"
J. Maxwell Chamberlain and Charles F. Daniels, New York, N. Y.

Discussors: Karl H. Pfuetze, Glen Ellyn, Illinois
Ralph T. Knight, Minneapolis, Minnesota.

"The Role of Diagnosis and Anesthesia in Surgery of the Heart,"
C. Rollins Hanlon, St. Louis, Missouri.

Discussors: Thomas J. Dry, Rochester, Minnesota
William O. McQuiston, Peoria, Illinois.

"Radiologic Aspects of Intrathoracic Disease,"
Fred J. Hodges and Robert S. MacIntyre, Ann Arbor, Michigan.

Discussors: Herbert C. Maier, New York, New York
R. J. Whitacre, East Cleveland, Ohio.

"Peroral Endoscopy: The Preparation of Patients,"
Arthur M. Olsen and John W. Pender, Rochester, Minnesota.

Discussor: John D. Steele, Milwaukee, Wisconsin.

SCIENTIFIC EXHIBITS

SECTION ON DISEASES OF THE CHEST

American Medical Association

June 9 - 13, Navy Pier, Chicago, Illinois

"Treatment of Tuberculosis with Hydrazine Derivatives of Isonicotinic Acid,"
Edward H. Robitzek and Irving J. Selikoff, with the assistance of Erich Mamlok and James A. Rogers, Sea View Hospital, Staten Island, N. Y.

"The Anti-Tuberculosis Activity of Two Hydrazines of Isonicotinic Acid,"
Gordon M. Meade, E. Osborne Coates and William Steenken Jr., Trudeau Sanatorium, Trudeau, New York, with the collaboration of Ray Brook State Tuberculosis Hospital, Ray Brook, New York.

"The Practicing Physician in Tuberculosis Control,"
Vivian V. Drenckhahn and F. A. Culver, National Tuberculosis Association, New York, New York.

"Isonicotinic Acid Hydrazide ('Nydrazid'): Pharmacology and Antituberculous Activity,"
John C. Burke, Richard Donovick, Bernard A. Steinberg and C. W. Armstrong, Squibb Institute for Medical Rseearch, New Brunswick, New Jersey.

"Iconicotinic Acid Hydrazide ('Nydrazid') in the Treatment of Tuberculosis,"
DuMont F. Elmendorf Jr., William U. Cawthon, Carl Muschenheim and Walsh McDermott, New York Hospital, New York.

"Clinicopathological Correlation in Pulmonary Tuberculosis,"
Nicholas D'Esopo, Edgar M. Medlar, Oscar Auerbach and Maurice Small, Veterans Administration Hospital, Sunmount and Brooklyn, New York.

"Neo-Penil, A Penicillin Ester with Unusual Pharmacologic and Clinical Properties,"
Harrison F. Flippin, L. E. Bartholomew, G. M. Eisenberg, R. J. Ferlauto, E. L. Foltz, W. V. Matteucci and N. H. Schimmel, Philadelphia General Hospital, Philadelphia, Pennsylvania.

"Carcinoma of the Lung in X-Ray Surveys,"
Alfred Goldman, Beverly Hills, Marvin S. Harris and I. Alfred Breckler, Cedars of Lebanon Hospital, Los Angeles and City of Hope, Duarte, California.

"Surgical Treatment of Emphysematous Blebs, Bullae and Congenital Pulmonary Cysts,"
Edward E. Avery, Jerome R. Head and T. R. Hudson, Wesley Memorial Hospital and Northwestern University Medical School, Chicago, Ill.

"Thoracoplasty with Subscapular Pack,"
W. E. Adams, William M. Lees, Robert T. Fox, James M. Fritz and Otto L. Bettag, Municipal Tuberculosis Sanitarium, University of Chicago, Stritch School of Medicine and Hines Veterans Hospital, Chicago, Illinois.

"Histoplasmosis—Clinical, Roentgenological, Epidemiological, and Laboratory Features,"
Michael L. Furcolow and J. Thomas Grayston, Federal Security Agency, Public Health Service and University of Kansas Medical Center, Kansas City, Kansas.

"Physical Methods Developed for the Prevention and Treatment of Pulmonary Atelectasis,"
Alvan L. Barach, Gustav Beck, H. Eugene Seanor and Hylan Bickerman, Presbyterian, Willard Parker and Goldwater Memorial Hospitals and Columbia University College of Physicians and Surgeons, New York, New York.

"Bronchial Rearrangement and Bronchiectasis Following Pulmonary Resection,"
Francis M. Woods, Alice Ettinger and Charles Bernstein, New England Center Hospital, Pratt Diagnostic Hospital, Brookline, Massachusetts.

"Arteriolization of the Coronary Sinus,"
Charles P. Bailey, Raymond C. Truex, Armond W. Angula, Hector P. Redondo Ramirez and Nicholas Antionius, Hahnemann Medical College and Hospital, Philadelphia, and St. Michael's Hospital, Newark, New Jersey.

"Bronchographic Studies in Bronchiectasis Before and After Pulmonary Resection,"
J. Antrim Crellin, J. Stauffer Lehman and Joseph L. Curry, Hahnemann Medical College and Hospital, Philadelphia, Pennsylvania.

The representative to the Scientific Exhibit from the Section on Diseases of the Chest is Edwin R. Levine, Chicago, Illinois.

College Chapter News

GEORGIA CHAPTER

The following program will be presented by the Georgia Chapter of the American College of Chest Physicians in conjunction with the Georgia Trudeau Society in the section of Chest Diseases during the annual meeting of the Georgia State Medical Society to be held at the Biltmore Hotel, Atlanta, Georgia, on May 13 and 14:

"Present Status of Antimicrobial Therapy in Tuberculosis,"
Ralph Tompsett, Associate Professor of Medicine, Cornell Medical College, Ithaca, New York.

"Problems in Diagnosis of Bronchogenic Carcinoma,"
Robert G. Ellison and James L. Alexander, Augusta, Georgia.

"Treatment of Tuberculous Meningitis,"
Rufus F. Payne, Rome, Georgia.

"Congenital Atresia of the Esophagus and Esophago-Tracheal Fistula,"
G. Richard King, Atlanta, Georgia.

"Anesthesia in Endoscopy,"
Lester Rumble, A. V. Oude and W. H. Calvin, Atlanta, Georgia.

"The Surgical Treatment of Residual Fibrocaseous Lesions in Pulmonary Tuberculosis,"
Raymond F. Corpe, Rome, Georgia.

PANEL DISCUSSION: "Cardiac Arrest"

Opening Discussion: William A. Hopkins, Atlanta, Georgia.

Discussors: James T. Priestly, Mayo Clinic, Rochester, Minnesota
Osler A. Abbott, Atlanta, Georgia
Perry P. Volpitto, Augusta, Georgia
Harvey Harper, Augusta, Georgia.

MINNESOTA CHAPTER

The Minnesota Chapter will present a program in conjunction with the Minnesota State Medical Association on May 26, 1952. There will be a luncheon at the Radisson Hotel, Minneapolis, after which the following scientific program will be presented:

John Briggs, St. Paul, Presiding.

"Segmental Resection in the Treatment of Pulmonary Infections,"
W. Robert Schmidt, Minneapolis.
Discussion, Nathan K. Jensen, Minneapolis.

"Roentgen Observations on Vascular Lesions of the Lungs,"
Leo Rigler, Minneapolis.
Discussion, Dan Fink, St. Paul.

"Treatment of Common Chest Emergencies,"
Thomas J. Kinsella, Minneapolis.
Discussion, Ivan Baronofsky, St. Paul.

"Interrelationships Between Cardiac and Pulmonary Diseases,"
Richard V. Ebert, Minneapolis.
Discussion, John Briggs, St. Paul.

NEW ENGLAND STATE CHAPTER

The monthly meeting of the combined New England States Chapter of the American College of Chest Physicians and the Overholt Clinic was held on Wednesday, March 19, 1952, at the Deaconess Hospital, Boston, Massachusetts. The speaker of the day was Dr. Robert Fienberg, and the subject of his talk was "Non-specific Granulomas." After the meeting dinner was served at the Hospital cafeteria.

John B. Andosca, Secretary.

PHILIPPINE CHAPTER

Dr. Horace DeLien, Director, Public Health Division of the United States Mutual Security Agency in the Philippines was guest speaker at a staff luncheon meeting held at the Quezon Institute, Manila, on January 29, 1952. Dr. DeLien was introduced by Dr. Miguel Canizares, Regent of the College for the Philippines.

In his talk on the control of tuberculosis in the Philippines, Dr. DeLien stated that "Tuberculosis in the Philippines is the leading cause of death," and he further stated that it is a challenge to the best minds in the Republic. He suggested that an all-out attack on tuberculosis be made by the medical profession, who in the final analysis must assume the leadership in combatting this tremendous problem.

POTOMAC CHAPTER

The Annual Meeting of the Potomac Chapter of the American College of Chest Physicians will be held in the small ballroom, Sheraton-Belvedere Hotel, Baltimore, Maryland, on May 15, 1952.

MORNING SESSION

Moderator: J. Winthrop Peabody, Professor of Diseases of the Respiratory System, Georgetown University Medical School, Washington, D. C.

"Some Aspects of Tuberculosis in Children,"
Presidential Address, Daniel Leo Finucane, Superintendent and Medical Director, Glenn Dale Sanatorium, Glenn Dale, Maryland.

"The Diagnosis and Management of Certain Acute Pulmonary Infections With a Discussion of Their Non-Specific Roentgen Appearance,"
Theodore E. Woodward, Associate Professor of Medicine, Department of Medicine, University of Maryland.

"Pneumoperitoneum Treatment of Pulmonary Tuberculosis and Hypertrophic Emphysema,"
Andrew L. Banyai, Associate Clinical Professor of Medicine, Marquette University School of Medicine.

AFTERNOON SESSION

Moderator: Daniel Leo Finucane, Superintendent and Medical Director at Glenn Dale Sanatorium, Glenn Dale, Maryland.

"Clinical Aspects of the Chemotherapy of Tuberculosis Including Isonicotinic Acid Hydrazide,"
Roger Mitchell, Associate Medical Director, Trudeau Sanatorium.

"Some Account of the Eleventh Conference on Chemotherapy of Tuberculosis,"
Arthur M. Walker, Veterans Administration, Washington, D. C.

"Segmental Resection in Tuberculosis Experience in Three Hundred Cases,"
J. Maxwell Chamberlin, Associate in Surgery, Columbia University.

"Resection in Pulmonary Tuberculosis,"
E. C. Drash, Clinical Professor of Surgery, University of Virginia School of Medicine.

Radiological Conference,
Paul Roman, Chief of the Department of Radiology, Lutheran Hospital, Baltimore.

A question period will follow each presentation.

Dr. Bernard Kleiman, Baltimore, presented an exhibit on a cast and anatomical study of the tracheobronchial tree for the interpretation of bronchograms.

ILLINOIS CHAPTER

The Illinois Chapter will hold its Annual Meeting at the Hotel Sherman in Chicago on May 13, 1952 at 9:30 a. m. This meeting will be held in conjunction with the annual meeting of the Illinois State Medical Society. Election of officers for 1952-53 and a scientific session will comprise the program.

Abel Froman, Secretary-Treasurer.

College News Notes

Dr. Burgess Gordon, President of Women's Medical College, Philadelphia, and head of the Medical Department, addressed the staff of the Atlantic County Hospital for Tuberculous Diseases on Thursday, March 13, speaking on the "Modern Management of Pulmonary Emphysema" with demonstration of "Intermittent Positive Pressure Breathing."

Dr. Charles Hyman, Medical Director of the Atlantic County Hospital for Tuberculous Diseases, reviewed the available literature on the use of the "Hydrazide of Isonicotinic Acid in the Therapy of Pulmonary Tuberculosis."

Dr. George C. Turner has been promoted from Instructor to Associate in Medicine at Northwestern University Medical School, Chicago.

Dr. David W. Heusinkveld of Cincinnati will serve as moderator for the course on "Chronic Lung Diseases," scheduled as one of twelve instructional courses to be presented during the 1952 Annual Meeting of the Ohio State Medical Association, which will be held in Cleveland on May 20-22. Panel members will include Doctors R. C. McKay, Cleveland; Karl P. Klassen, Columbus; and Elmer R. Maurer, Cincinnati. The course will take place from 11:00 to 11:30 a. m. on May 21.

The Minnesota Tuberculosis and Health Association (formerly called the Minnesota Public Health Association) has established the H. Longstreet Taylor grant of $7,500 to be made annually to the University of Minnesota for tuberculosis research. It will be administered by Dr. J. Arthur Myers, professor of Preventive Medicine and Public Health at the University of Minnesota, and Chairman of the Editorial Board of *Diseases of the Chest*.

Dr. Herman E. Hilrleboe of Albany, New York, has been cited by the Regents of the University of Minnesota in recognition of noted professional attainment.

Dr. Emanuel Klosk has been promoted to Adjunct in Medicine at Beth Israel Hospital, Newark, New Jersey.

Dr. Ezra V. Bridge, Superintendent of the Cannon Falls Sanatorium, spoke on the "Modern Treatment of Tuberculosis" at a joint meeting of several nurses groups at St. Lucas Hospital, Faribault, Minnesota, on February 11.

Dr. Edgar W. Davis, Governor of the American College of Chest Physicians for Washington, D. C., addressed the Southern Chapter of the International College of Surgeons in Birmingham, Alabama, on February 15. On this occasion he presented a paper on "The Surgical Treatment of Mitral Stenosis." The following day he participated in a symposium and panel discussion on "Surgical Treatment of Tuberculosis."

Dr. Sidney Dressler, who served as Assistant Medical Director for the past five years, has been elevated to Medical Director of the National Jewish Hospital, Denver, Colorado.

Dr. Carl Mulky, Governor of the College for New Mexico, was honored in Socorro on January 31, at the New Mexico Medical Advisory Conference, sponsored jointly by the New Mexico Medical Society and the New Mexico Department of Public Welfare. The day was designated as "Carl Mulky Day" in recognition of Dr. Mulky's entering his 50th year of medical practice, his many services to the state and his activities in the campaign against tuberculosis.

The Third Annual Postgraduate Course in Tuberculosis sponsored by the Provincial Committee for the Prevention of Tuberculosis was presented in Montreal, Quebec, April 23 through 26. The course was given in cooperation with the University of Montreal, Hospital du Sacre-Coeur, Montreal Neurological Institute, Hospital Sanatorium St. Joseph and the Royal Edward Laurentian Hospital. Dr. Chevalier L. Jackson, Philadelphia, President of the College, was invited to be the guest of the Committee at a dinner held on April 23. The committee in charge of the organization and arrangements for the course were Dr. Fernand Hebert, President; Dr. A. L'Esperance, Vice-President; and Dr. B. Guy Begin, Secretary-Treasurer.

Dr. Clifford Kalb spoke before the Milwaukee Metropolitan Section at the Medford Hotel, Milwaukee, February 28. His topic was the "Modern Management of Bronchial Asthma." On March 28, Dr. Elston L. Belknap spoke before the same group at the Medford Hotel on the subject, "Possible Chest Hazards in the Brewery Industry." After each presentation there was a stimulating round table discussion.

Postgraduate Course

The Postgraduate Course in Diseases of the Chest, presented by the Council on Postgraduate Education and the Wisconsin Chapter of the American College of Chest Physicians, together with the Wisconsin Chapter of the American Academy of General Practice and the Marquette University School of Medicine, will be presented on the morning of May 3 and 10, 1952. These meetings are taking place in the auditorium of the Veterans Hospital, Wood, Wisconsin.

MAY 3

Moderator: Mark Gray, Associate Clinical Professor of Medicine, Marquette University and Chief of Medical Service, Veterans Administration Hospital, Wood.

"Interpretation of Basal and Lobar Lung Shadows,"
H. H. Wright.

"Interpretation of Triangular and Ring Shadows,"
S. A. Morton.

"Significance of the Cardiac and Mediastinal Silhouettes,"
Mischa J. Lustok.

MAY 10

Moderator: Roger Hemphill, Associate in Medicine, Marquette University and Chief of Tuberculosis Service, Veterans Administration, Wood.

"Increased Translucency,"
Leon H. Hirsh.

"Interpretation of Round Lung Shadows,"
Jerome L. Marks.

"Interpretation of Disseminated Nodular Lung Shadows,"
Andrew L. Banyai.

CONGRESSES IN RIO DE JANEIRO

The XII Congress of the International Union Against Tuberculosis and the II International Congress on Diseases of the Chest sponsored by the Council on International Affairs, American College of Chest Physicians, will be held in Rio de Janeiro, Brazil, August 24 through 30, 1952. Members interested in attending these Congresses are invited to write to the Executive Offices of the College in Chicago for further information.

COURSES IN LABORATORY DIAGNOSIS OF TUBERCULOSIS

In cooperation with the Division of Chronic Disease and Tuberculosis, Public Health Service, the Bacteriology Laboratories of the Communicable Disease Center, Chamblee, Georgia, will offer two courses in the laboratory diagnosis of tuberculosis on the following dates: May 19-23, 1952, and November 3-7, 1952.

Practical laboratory training in all phases of tuberculosis bacteriology, including preparation of culture media, microscopy, cultural procedures, diagnostic use of animals, and testing of drug sensitivity will be included in the course. No tuition or laboratory fees are charged. Reservations for the courses should be made as soon as possible.

Additional information and applications may be obtained from the Officer in Charge, Laboratory Training Services, Communicable Disease Center, Public Health Service, P. O. Box 185, Chamblee, Georgia.

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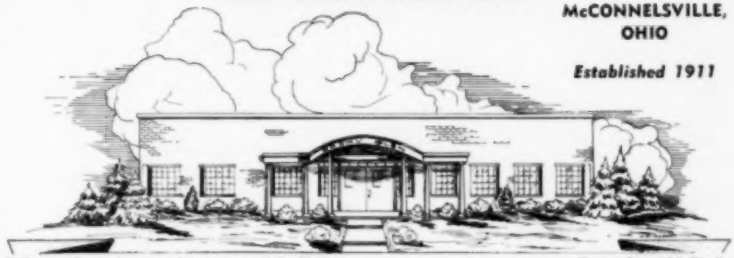

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3. A modern 50-bed General Hospital with one wing exclusively for surgery on the tuberculous. Included on the staff are three Diplomates of Thoracic Surgery and two Anesthesiologists.
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The facilities of the Medical Service Bureau of the American College of Chest Physicians are available to all who are interested in seeking positions or obtaining applicants in the field of chest diseases. If you wish to advertise in *Diseases of the Chest*, please write to the Medical Service Bureau, American College of Chest Physicians, 112 East Chestnut Street, Chicago 11, Illinois, for rates and further information.

POSITIONS AVAILABLE

Internist trained in diseases of the chest needed in one of the New England States. Private practice in addition to small sanatorium. For further information please address Box 246A, American College of Chest Physicians, 112 East Chestnut St., Chicago 11, Ill.

Physicians wanted, full time, for new 440 bed tuberculosis division of large general hospital. Associated with two medical schools for teaching purposes; opportunity for research. Complete medical, surgical and pathological facilities. House staff includes straight and rotating internes from general hospital staff. Salary governed by background of training and experience. Please address Box 248A, American College of Chest Physicians, 112 East Chestnut St., Chicago 11, Ill.

Senior resident physician wanted for modern 240 bed New Jersey tuberculosis sanatorium. American graduate with adequate training in a modern tuberculosis sanatorium, experience in selecting surgical tuberculosis cases and postoperative care is required. Civil service examination not required. No state income tax. Doctor with wife and one child acceptable. Complete maintenance on the grounds granted. Salary open. Give complete information in first letter. Please address Box 250A, American College of Chest Physicians, 112 East Chestnut Street, Chicago 11, Illinois.

The Westboro State Hospital offers attractive positions for physicians interested in active training and practice in Psychiatry and Tuberculosis. Physicians must be able to qualify for Massachusetts license. Please address Superintendent, Westboro State Hospital, Westboro, Massachusetts.

POSITIONS WANTED

Woman physician, licensed in the state of New York, U. S. citizen, with years of experience in general medicine, as well as in the tuberculosis field, desires position beginning July 1, 1952. Please address Box 264B, American College of Chest Physicians, 112 East Chestnut St., Chicago 11, Ill.

Chest specialist, 42, F.C.C.P., and certified by the American Board of Internal Medicine, with many years of experience in pulmonary diseases, desires position in Eastern or other large city. Interested in institutional or group practice. Excellent references. Available now. Please address Box 265B, American College of Chest Physicians, 112 East Chestnut St., Chicago 11, Illinois.

LILLY REDUCES PENICILLIN PRICES

Eli Lilly and Company of Indianapolis announced a substantial reduction in the price of penicillin on March 26, 1952. The reductions ranged from ten to thirty-eight per cent on various forms of the drug, with an average of twenty-five per cent.

This is the second time in the last three months that Lilly's has lowered the price of penicillin. The public, which last year spent an estimated $300,000,000 on penicillin and streptomycin alone, stands to have its medicine bill reduced considerably in 1952. One out of three Americans received an injection of penicillin during 1951.

Striking improvements in production methods are chiefly responsible for the continuing downward trend of prices. Little more than ten years ago, penicillin cost about eighty times the price today. In addition, improved forms of the drug are ten times as potent and last six times as long as the old product.

It is a provocative thought that of the nine leading or first causes of death, tuberculosis is the only one that we possess the means to eradicate.—Edward W. Hayes, M.D., Calif. Med., December 1950.

Like other chronic diseases, tuberculosis is a continuous process progressing by infinitesimal degrees, from the first moment of infection through the various stages leading to recovery, chronicity, or death.—Donald Ottenberg, M.D., *et al.*, Pub. Health Reports, July 6, 1951.

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Donald F. Rowles, M.D., Oakland
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Medical Director

COLLEGE EVENTS

18th Annual Meeting, American College of Chest Physicians, Congress Hotel, Chicago, Illinois, June 5-8, 1952.

XII Congress, International Union Against Tuberculosis
II International Congress on Diseases of the Chest
Rio de Janeiro, Brazil, August 24-30, 1952.

Wisconsin Postgraduate Course, Veterans Hospital, Wood, Wisconsin, May 10, 1952.
Illinois Chapter Meeting, Chicago, May 13, 1952.
Georgia Chapter Meeting, Atlanta, May 13-14, 1952.
Potomac Chapter Meeting, Baltimore, Maryland, May 15, 1952.
New York Chapter Meeting, New York City, May 15, 1952.
New Jersey Chapter Meeting, Atlantic City, May 20, 1952.
Minnesota Chapter Meeting, Minneapolis, May 26, 1952.
Chicago Postgraduate Course, October 6-10, 1952.
New York Postgraduate Course, November 2-6, 1952.

18th ANNUAL MEETING

COLLEGE HEADQUARTERS
112 East Chestnut Street, Chicago, Illinois

American College of Chest Physicians

Chicago, Illinois — June 5 - 8, 1952

Attend the Open House at the College Headquarters
Sunday, June 8, 1952 — 6 to 8 P. M.

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MR. HARRY ESKY, Sales Manager, Congress Hotel, Chicago, Illinois.

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Dear Doctor:

It has been the policy of our organization to make available to tuberculosis sanatoria, tuberculosis specialists and other qualified investigators those new developments in the chemotherapy of tuberculosis which show promise of offering a possible answer to the problem of tuberculosis.

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